

November 30, 1929

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# AVIATION

*The Oldest American Aeronautical Magazine*



THE *Western Show* AND *Airport Conference*

BALANCING *Weight* AND *Costs* IN MATERIALS

THE *Hall* SHIPBOARD FIGHTER





## The "Corsair"...the eyes of the Navy



The "Corsair" with its 425 H. P. "Wasp" engine adapted to a high performance amphibian for the aircraft carriers of the Navy

**M**ODERN problems in naval warfare involve tremendous ranges. As the standardized observation plane of the Navy the "Corsair" has enabled spotters to increase their vision far beyond that afforded from the "tops." It has proved its worth with thousands of hours of satisfactory service.

The utility of the "Corsair" has been further extended by the addition of amphibian gear. Thus equipped it can be launched

from a battleship catapult, landed on the deck of a carrier, on the sea or at a shore station.

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**CHANCE VUGHT CORPORATION**  
DIVISION OF UNITED AIRCRAFT & TRANSPORT CORPORATION  
Long Island City, New York

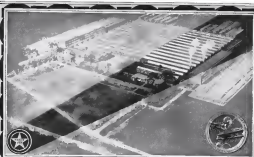
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# BUILT UNDER ONE ROOF

**ARGO**  
DEPARTMENT  
OF COMMERCE  
CERTIFICATE  
NUMBER 175

**HESS-WARRIOR**  
DEPARTMENT  
OF COMMERCE  
CERTIFICATE  
NUMBER 54

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MANUFACTURERS AIRPLANES • AIRPLANE ENGINES  
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Builder of Quality Aircraft since 1909  
BALTIMORE, MARYLAND



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ELIMINATE faulty lubrication and you do away with an important cause of engine failure. On every mile of stream TP Aero Motor Lubricating Oil keeps the engine running smoothly—helps to deliver the mails on time.

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And the designs of the new Nemours Acroplane Fabrics express vividly the buoyancy and gusto appropriate to modern air transportation.

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# TRIED the OTHERS

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"WE have tried numerous aviation gasolines and oils," said Ray Ahern, chief pilot of the Red Wing Flying Service, Inc., of Ware, Mass., "but we have always come back to Socony products. Our advance purchasing man has orders to buy only Socony in New York and New England."

This is the opinion of a crack pilot who has had more than four thousand hours of flying to his credit, and is a member of the famous Caterpillar Club.

Before using Socony Aircraft Oil, Ahern put it to a severe test: The plane was flown for twenty hours with an average of five minutes to the flight. This continual opening and closing of the motor is unusually severe on oil. At the completion of the long day's grind, a check showed that only two quarts of oil were used, and the remainder was in excellent condition.

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## AXELSON

### *Airplane Engines*



## Bates paid me the finest compliment I've ever had

Bates flies because he's keen about it, and because it saves him good business days every month. When he asked me to go to Boston with him in his Sikorsky Amphibion I broke three dates to do it.

We slid into one of the most comfortable pilot's cockpits I've ever sat in. Roomy. And you can adjust the seat to suit yourself. The engines were warm and Bates picked her off the water with scarcely any run at all. I noticed she climbed fast, and very easily. Bates circled the Bay and put her on her course.

And then . . .



## He passed me the wheel of his Sikorsky Amphibion

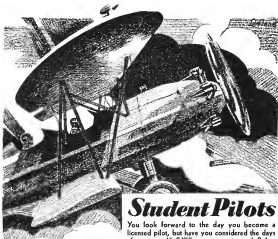
Bates glanced at me and swung the control wheel over into my hands.

I seldom fly large ships, and I thought of the "S-38" as something a bit difficult to handle. I got the surprise of my life. She controls easily and naturally and is absolutely alive with reserve capacity to do all you ask of her. When I set her down in Boston Harbor, Bates smiled approvingly.

You can guess how much Bates thinks of that ship. She'll do more than 125 miles an hour, climb to 18,000 feet, and fly and maneuver on either engine. His passing over the controls was the finest compliment I've ever had.

**SIKORSKY  
AVIATION CORPORATION**  
Bridgeport, Connecticut

DIVISION OF UNITED AIRCRAFT & TRANSPORT CORPORATION



## Student Pilots

You look forward to the day you become a licensed pilot, but have you considered the days after you qualify? What are you going to do? Are you spending your time and money to become a sports pilot or are you building for the future?

If you want to know how you can make your flight training pay for itself—if you want to learn how others are making good incomes, become acquainted with the **BIRD PLAN**.

Write today and tell us about yourself—the number of hours of instruction, when you expect to qualify—and we'll show you how others are making money on this plan.

### SPEED + SAFETY

Ever since the first Brunner-Winkle BIRD took the air it has held the standard for performance with safety.

In external construction, its wing design, its inherent stability—every item of its design and assembly have lifted this plane to its superior position in the popular priced class.

And now the NEW BIRD powered by Kinner 90 H.P. (Approved Certificate No. 329) will win even higher praise for its **ECONOMY** with **SAFETY** and **PERFORMANCE**!

**BRUNNER-WINKLE AIRCRAFT CORPORATION**

17 Haverkamp St., Brooklyn, N. Y.



## Cords that are *Stretch Matched* and Rubber that is "Water Cured"

### Make Take-Offs Quicker, Planes Swifter and Landings Safer on



4 MORE STRETCH-MATCHED cords in the square inch give Goodrich Split-Second Silvertown just what much more needed: strength and resiliency. They give Goodrich tires a margin of safety and performance.



THE WATER CURING principle of shoe making, as applied to tires, would have produced the next speeded success. Goodrich Water Cured Tires are evenly baked all the way through ensuring uniform strength and elasticity at every point.



### GOODRICH SPLIT-SECOND SILVERTOWNS

UNLIKE the tire on an automobile, the airplane tire is an integral part of the plane.

Practice an automobile tire and you can control it with the steering wheel. But here an airplane tire and over goes the plane.

Strength in airplane tire construction, therefore, is vitally important.

Goodrich has attained strength without sacrificing lightness of the tire and the plane's speed, by combining the stretch-matched cord construction with the famous Goodrich "water cure" rubber toughening process.

Every Goodrich airplane tire, therefore, is tough right on down.

GOODRICH TIRES are light of weight yet strong enough of construction to withstand take-off conditions on the worst of landing fields.

Even THE GOODRICH NON-SKID machine has a special skid-resistant tread that enables pilots to take off on a water-soaked field without any appreciable reduction in flying speed.

to the innermost ply. On the leading gear of airplanes they make take-offs quicker, the planes swifter and landings safer.

No more claims need be made for Goodrich Split-Second Silvertowns... world records have proved them!

The B.F. Goodrich Rubber Company, Established 1870, Akron, Ohio. Pacific Goodrich Rubber Company, Los Angeles, Calif. In Canada Canadian Goodrich Company, Kitchener, Ont.



# Goodrich

Rubber for Aviation

# Pre-Inventory Sale

Special low prices on quality items in order to reduce stock before inventory taking time. All prices good only until January 1st.



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Leather Colored Caps  
Stitching and Lining

A superior helmet of best quality with your leather with a comfortable and well fitting interior. Made in U.S. and is a really well made helmet. It will stand up to the most severe tests. It is made of the best leather and is made in the U.S. It is made of the best leather and is made in the U.S. It is made of the best leather and is made in the U.S.

**\$4.00**

26x4 Wheels—New (Climber).....	\$11.50
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All new merchandise in perfect condition and at prices far lower than any other quotation you have received. Every item is standard and first quality—every one a bargain.

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Hartzell Propeller (1) (Used) Waco 10 with hub.....	48.00
Curtiss-Robin Propeller (1) (Used) OX-5.....	109.00
Hiscope-Rodex (Model A) Propeller (Used).....	60.00

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Complete stocks of all kinds of aeronautical supplies prompt shipment service. Every item fully guaranteed to meet A-1 specifications at retail prices set by commercial necessity. Prices are consistently lower because of our large quantity purchases. Write for catalog to Dept. W.



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These Dressed Mittens  
Five Quality Leather Mittens  
Made of the best leather with a comfortable and well fitting interior. Made in U.S. and is a really well made mitten. It will stand up to the most severe tests. It is made of the best leather and is made in the U.S. It is made of the best leather and is made in the U.S.

**\$4.00**

# EMSCO

A COMPLETE LINE OF AIRCRAFT FOR LAND AND SEA



This plane is perfect for the pilot who wants a small, simple, and easy to fly plane. It is made of the best materials and is made in the U.S. It is made of the best materials and is made in the U.S.



This plane is perfect for the pilot who wants a small, simple, and easy to fly plane. It is made of the best materials and is made in the U.S. It is made of the best materials and is made in the U.S.



This plane is perfect for the pilot who wants a small, simple, and easy to fly plane. It is made of the best materials and is made in the U.S. It is made of the best materials and is made in the U.S.

## EACH A LEADER IN ITS CLASS

Engineered on sound principles that have been proven by years of experience in commercial and military aviation. Built by master craftsmen in a new \$1,500,000 factory equipped with the most modern approved production methods. These three types of Emco Aircraft are among every day their superiority in providing safe air transportation with greatest economy.

The Emco Circo has been cross country under normal flying conditions with a fuel consumption of only 4.8 gallons per hour at cruising speed. Twice the 8 is, powered with a 200 h. p. Wright Whirlwind has taken off a gross load of approximately 7000 pounds with a run of a half mile. The Emco Challenger has demonstrated its dependability, safety and economy by flying

more than 15,000 miles under all conditions, while the last four months.

The Emco Alphonso Carpentier is the most recent addition to the world wide chain of Emco airplanes, which now number nearly a score. Most prominent among them is the Emco Darrick & Equipment Co., with plants in Los Angeles, Calif., and Dallas and Houston, Tex. The same sound business principles that have made the name EMSCO on drilling and production equipment, in the oil fields of the world, a guarantee of quality and integrity, are the foundation of this new industry which is but a logical and forward step in the mounting out of Emco Industrial and commercial activity.

All Emco land planes are delivered from the factory with piston fittings in that an exacting design as necessary to quickly adapt them to engine power. The 8-0 may only be converted into a 10-horsepower plane in fitting for reduced motor use. Alternatively the plane can be changed. Complete specifications, performance data and price will be forwarded on request.







## Speeding up airplane production and servicing with Curtis compressed air equipment

FULLY as important as the speed of planes in the speeding up of the building, maintenance and servicing of planes. Executions throughout the aviation industry are rapidly coming to realize that compressed air is one of the most important factors in speeding up and servicing.

Obviously, time, labor and money are saved in very appreciable amounts by compressed air equipment such as—

**CURTIS TIMKEN EQUIPPED COMPRESSORS**—providing air for spray painting, spraying dope on the wings, tire inflation, charging shock absorbers, spray cleaning, spraying of grease solvents, air pump requirements, air drying of parts dipped in cleaning solutions, blowing out dust, chips, etc., or work benches and drilling presses, air power for operating air hoists, cranes, pneumatic drills, sand blasters, pneumatic water systems, etc.

**CURTIS AIR HOISTS**—Power hoists at little more than the cost of chain blocks. Used with a Curtis I-Beam Trolley or Crane, they can serve a wide floor area. Used for lifting engines out of fuselages, mounting engines and other parts, and many other purposes where a combination of power, speed and accuracy is a factor of economy. Because there are no delicate mechanisms, even unskilled laborers can operate Curtis Hoists without danger of throwing them out of commission.

**CURTIS AIR TANKS**—Portable tanks for taking air out to a plane away from the usual source of supply. No heavy tanks for use with compressor unit in the shop, also operate tanks for motoring an engine.

# CURTIS

## St. Louis

The Curtis Pneumatic Machinery Co. was founded in 1914 and is headquartered in St. Louis, Mo. It has since grown into a company that manufactures and distributes a wide variety of compressed air equipment. The company's products are used in a wide range of industries, from aviation to manufacturing.

304 Linden Ave., St. Louis  
308 AF Station, St. Louis, Mo.

Circle products in which interested.

Write names and address in margin and mail.

40

41

This WACO with John Livingston at the controls, earned a total of 11:57.7 minutes in winning the Edsel Ford Reliability Trophy. A total of 144 points over the seven competing models.



## WACO's Dependable Performance PROVED again!

### "On time" 122 out of 126 laps in the last two National Air Tours

When you start out to go somewhere in a WACO, you can depend on getting there! This dependable performance has been largely responsible for the popularity and success of WACO airplanes. But... if additional speed was wanted... the record of the WACO winner in the last two National Air Tours supplies it in generous measure.

Flying on schedules timed to the second... covering a total of

11,200 miles in both Tours, divided into 65 legs averaging 175 miles to the lap... flying in all kinds of weather and over all kinds of territory... the two WACO entries in each Tour reported late at the control points only four times out of 126. And only a few minutes late, at that. The winner of this year's Tour, John Livingston, had a perfect score for every lap. To do that he needed to average only 115.2

miles per hour. Actually, his average for the 5,607 miles was 129.57 m.p.h. Art Davis, in the second-place WACO, was only a shade under Livingston's figures, averaging 129.62 m.p.h.

WACO retains the Edsel Ford Reliability Trophy! Likewise undisturbed is WACO's leading position in the number of registered aircraft, according to Dept. of Commerce records. And in both cases the reason is the same:

If you start out to go somewhere in a WACO, you can depend on getting there!

THE WACO AIRCRAFT COMPANY, TROY, OHIO



"Ask any Pilot"

If you are interested in complete detailed record of the Fifth National Air Tour, ask us for John Livingston's own story in booklet form.





THE OLDEST AMERICAN AERONAUTICAL MAGAZINE

A MONTHLY PUBLICATION ESTABLISHED 1914

EDWARD F. WARNER, Editor

VOLUME 11 . . . November 30, 1929 . . . NUMBER 11



## Rate-Cutting on Air Lines

AS HENRY FORD observed in the earliest days of automobilizing, there are two ways of selling a business self-supporting. One may have a small trade at a high price, necessary to balance large overhead and generally high unit costs resulting from inferior production, or do a vast business at prices reduced to keep pace with the economies of mass production. There need not even be a difference in the quality of the article produced under the two alternative systems, unless the unit price finds itself governed by competition. If Mr. Ford were now the only maker of automobiles, and able to disregard everyone except his customers, he might either build his present car in the present quantities, or turn out one ten thousand at a time, of the same model, sell them at a price many times higher, and make a unit profit not much higher than under present conditions and infinitely smaller total profit.

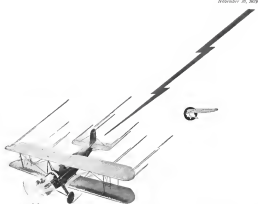
So with air transport. It can be run retail or wholesale. If a complete ground organization and mechanical staff had to be kept up to provide one round trip a week over a long route, it might be necessary to charge 25 cents a passenger mile to make both ends meet. Make the service a daily one, and unit costs come down. Schedule hourly departures and they drop again. We have so far been on the retail scale. To get away from it, and to increase the volume of operation so that the burden of overhead may be lightened, constitutes the major dilemma of air transport operation.

Taking it for granted that air lines in the United States will receive no direct subsidy, operators have only two alternatives. In one case can it be expected that traffic volume will develop instantaneously, however low the rates might be set and however many planes might be put into the service. It takes time for the existence of a new medium of transport to sink into the public consciousness so that its use becomes normal and automatic. A new habit has to be established. In the meantime, the rates upon air lines may either be set so

high that they will show a profit from the start, with the expectation of a gradual reduction as traffic on the line increases, or they may be radically slashed to start with, with deliberate resignation to an operating loss until such time as the public may have become accustomed to using the line. The first option is less prodigal of the company's resources during the development period, but the second gets quicker results.

Theoretically, there is a free choice between the two courses. Actually, it is doubtful if the first could be literally carried out except as a few specially favored routes. Only where existing means of transport are inefficiently slow or inefficient is there such a compelling demand for the services of an air line as to enable one to cover operating expenses from the very first—but that financial disability it shares with very nearly every other novelty in transportation that has been introduced in modern times.

The question is then rather one of how rapid a drain upon capital can be made. The lower the rates, the sooner we shall have a billion passenger miles a year of traffic instead of one-one hundredth of that amount. The cutting of rates wherever a substantial operating loss can be accepted, and whether or not competition is a factor, is a step forward and brings the time of really profitable operation nearer. To justify economically the idea that some of the lines are charging now, they would have to increase their volume of business at least fourfold, and then perhaps four times again on top of that—but they have made it economically possible for the public to ride in sixteen times the present numbers, and they have only to wait for a realization of that fact to sink in. Fortunately most of the transport companies have enough reserve of capital to carry the load. We currently hope that they will all adhere, even more definitely than in the past, to the policy of living rates at which there is a large potential demand and then looking forward to rapid and continuous expansion of the volume of their service as

NEVER A BREACH  
OF FAITH

Spartan believes that in the manufacture of airplanes any sacrifice of perfection to haste is a breach of faith with some pilot. As a result every Spartan reaches its owner flawless in material, perfect in workmanship and rigorously tested.

The world's finest products are painstakingly made by hand, because skilled human touch is essential to the fine product. Perfect workmanship is one of those Spartan standards which will remain consistently inflexible through the years, making exacting demands on the Spartan organization . . . in engineering, in construction and in the performance of Spartan airplanes.

**SPARTAN AIRCRAFT COMPANY**  
TULSA . . . . . OKLAHOMA

Write for description, folder and photograph of the Spartan C-140, powered by the Wright Whetstone Six . . . Approved Type Certificate Number 139.

performance to trying to bring rates, demand, and operating costs into reasonable equilibrium.

In the meantime, it is particularly important that the government's air mail compensation policy should remain reasonably liberal to help carry over this critical transition period of stimulation of new business.

## //

### Wanted, Courage!

WITH his customary talent for going to the heart of any matter, President Hoover has struck at the fundamental cause of business depressions, and especially in the case of business stability that was manifest in the recent stock market debacle. While there has been no specific mention of the aircraft industry so far calls of conferences of industrial leaders, his action has a very definite lesson for the manufacturers and operators of aircraft. They should redouble upon it and shape their courses accordingly.

There are several different levels of business depression, and economies provide even more different kinds of explanations, but it is most cases they resolve themselves into the cumulative results of wide-spread panic. Let a sufficient number of stockholders become frightened at the same time and they will dump their securities upon the market at auction prices, utterly without relation to the value of the property that they represent. Conversely, it may be observed that it is equally possible for a large body of speculators to whip themselves and each other up into an enthusiasm producing equally adverse results on prices at the other extreme.

What is most patently apparent in the stock exchange is not confined to that turbulent realm. The same psychology operates upon manufacturing, transportation, and other business enterprises. Let the builder of any product suspect that business is to be bad, and he sends down production and lays off employees. With their buying power contracted, those who have had them as customers are obliged to reduce in turn. The cumulative process of contracting gathers momentum like the proverbial snowball, and the fear of hard times will have made them a fact.

What any industry needs at such a time, and what the aircraft industry particularly needs at this time, is a definite display of courage and confidence in high places, such as has been afforded by the assurance given by national executives after their conference at the White House that there would be no cutbacks in their plans for the future.

The production of aircraft must be seasonal and it must be matched up with current markets. When selling actually slows down, production is bound to do likewise, but there is no excuse for any company on a sound footing slowing down its effort to find markets.

The aircraft industry, like every other, is going to have its seasonal losses and deficits, but the general trend must be steadily forward. Companies that expect to be in business ten years from now will have to keep pushing forward steadily. To back water because of a temporary recession in the stock market, or to stop trying to sell airplanes because sales have fallen off, is as irresponsible as a child's fear of the dark. A great French general once warned us of the whole art of war in the vigorous aphorism "L'audace, l'audace, tous-jours l'audace" which was freely translated in a Broadway spectacle of a few years ago, "Nerve, nerve, and then a lot more nerve." The motto is an excellent one for all business in time of threatened setback, and if it be widely enough adopted business depressions will be few and far between. It is a particularly sound precept for the aircraft industry for the year to come.

## //

### Seeing Football from the Air

IT MAY BE a little late to comment upon the relation of aviation to the football season, but the Department of Commerce has given us the excuse. Mr. Stalweg's warning to pilots of the rules that they are supposed to follow when in the neighborhood of a stadium deserves editorial emphasis. It should be borne in mind during the "intermission" games which will dot the southern part of the country for the next month. It should register clearly enough upon every pilot's consciousness so that it will not be necessary to repeat it next year.

While the seeing of a football game from directly above and from a low altitude has the charm of novelty, no way has yet been discovered of ensuring that point of vantage without serious consequences upon the rights of the spectators in the stands. Even though the airplane never gets into such a position that there would be actual danger in case of engine failure, the ordinary spectator is not an unreasonable person, and cannot be expected accurately to measure probable gliding angles with his eye. He knows only that he is being seriously disturbed, and that if the plane should "fall" is a hypothetical danger that the average citizen is not yet able to put entirely out of his mind, be he or his neighbors who live on his soil, or the third for a definite purpose and he wants either some or motion elsewhere than on the field to direct his attention. While it would, of course, be impossible to operate airplanes at all if every fear or prejudice of one group of spectators had to be taken in preparing a compromise, those who dare set for a sporting spectacle are entitled to enjoy it free of any disturbance of mind, body, or nervous system.

Newspapers want to show their readers a birdseye view of the field and the crowd, and it would be a pity from all points of view to deny them the opportunity entirely. In any case, the legitimate operations of regular aerial photographers are unlikely to make trouble, for they know what they are doing, and they get it with a minimum of wasted time and usually without any occasion to fly close to the ground. There should be some check even upon photographic flying, but it need not be by any means eliminated.

The greatest problem is the private flyer or professional pilot out to satisfy his own curiosity and the curiosity of the flying public. While we would be the last to suggest any check upon advertising initiatives, we do heartily condemn any operation at places bearing advertising signs back and forth above a stadium with the deliberate intention of compelling the regard of the audience. It inevitably leads to annoyance, if not to dangerously low flying. The regulations of the Department of Commerce are properly strict upon this subject of flying over crowds. It is not sufficient merely to say at a height permitting a glide to a safe landing place. We probably hope that every pilot will feel an obligation to display even more caution and courtesy than the Department's rules require, an obligation best fulfilled by giving the football field a wide berth except when definite business requires passage through its neighborhood at an angle alternate and for a limited time.

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### The Road Over the Atlantic

THIRTY MONTHS have passed since Lindbergh's momentous leap, and the enthusiastic proclamations then popular that regular commercial airplane service would be established in the immediate future have had time to cook. Trans-Atlantic commercial flying continues the object of serious attention, but its nature has changed. It is for the most part easy, and should remain, an intelligent attention which takes account of the limitations and the difficulties and which examines the possibilities to push into print with spectacular projects assumed both technically and economically.

Looking at the current quite cold-bloodedly, the fact is that there is no airplane now in existence, nor for a while can be definitely known in early prospect, which is capable of traversing non-stop the over two thousand miles with reasonable economy and with a reasonable margin of safety for adverse weather conditions. As a matter of fact, in setting the figure at two thousand miles we are trying to be extremely generous. It would hardly be safe to plan on going beyond sixty per cent of that mileage for a regular service over either land or sea. Regular New York-Penn service without any inter-

mediate stop is for the present, and so far as we can see for some time to come, utterly out of the question. The formulation of projects for any such service prior to the actual and massive demonstration of aircraft with performance distinctly superior to any now available is a waste of time which could be better employed elsewhere.

Leaving aside that pleasing but for the present unrealistic idea, there are still a number of ways of maintaining an Atlantic air service. There is the South Atlantic, favored by the French and Germans, but of limited direct interest to North Americans. In our own hemisphere there are the convenient narrow stepping stones offered by the Azores and the Bermuda group. Turning further to the north, the bowdler of the journey at Greenland and Iceland comes in for notice, and the straight jump between Newfoundland and Iceland is at least worthy of theoretical consideration, although even that is rather far beyond the realm of commercial possibility just now. Finally, there are the floating islands projected by Mr. Armstrong, their number and spacing being limited only by commercial considerations.

The editorial column has so far placed in which to analyze in detail the relative merits of the various plans, but it is appropriate to call attention to a couple of facts that apply to all of them alike. In the first place, the machines used must be seaworthy boats of some sort. No sailing landplane, however well-engineered, is sufficiently free from the danger of forced landing to be flown over long stretches of water on a regular commercial practice. Second, practically all of the possible alternatives present a problem of navigation which almost overbalances everything else. Assured accuracy of navigation and under the worst conditions is a fundamental necessity. A lack of certainty that the aircraft could reversibly be located without waste of time and fuel is enough around to look for them has been the principal factor responsible for the lack of an air service to Bermuda. The losses of aerial seamen will be yet more difficult.

Nothing that now exists is good enough, although radio navigation presents an obvious help with further development. The important point is that navigation be recognized as a key problem, of importance commensurate with the improvement of the technical characteristics of the airplanes. The difficulties in the way of trans-oceanic service by airplanes following since one of the "stepping-stone routes" are by no means personally insuperable, but they are real difficulties. These sudden conquest is not to be hoped for. They deserve the constant attention of those most advantageously competent to deal with them, and our best wishes go with all service workers in the field, but it will be most advantageous if a movement of excited concentration on commercial Atlantic air service should direct either effort or purse toward undertakings of much more practical significance.

# HIGHLIGHTS OF THE Western AIRCRAFT SHOW

**I**N THE FACE of general aircraft sales slumps, the Western Aircraft Show held in Los Angeles, Nov. 9 to 17 inclusive, proved conclusively that there does exist among the general public an active buyer's interest in aircraft. As a retail sales show the exposition was an unqualified success, and yet there was scarcely, it may be said, one sale from the show floor. The success of the show lay rather in the very real buyer interest which was created in airplanes and in the many contacts and arrangements for demonstration flights which will surely result in several sales during the period following the show. Probably for the first time an aviation show has approached the hazy condition common to most automobile shows, in that auto shows are not held for the purpose of making quantity retail sales, but rather to stimulate buying interest which will carry over through the sales season, and which will seem to build up a live prospect list in a dealer's say shop any other method.

Up until the present time the aviation industry has been attending air shows on a mass and selling hundreds of planes in each other, with a minimum of attention given to the general public which is after all the ultimate consumer of all aircraft produced. Los Angeles is in the center of the most highly competitive aircraft market in the world. Almost every substantial aircraft builder is actively represented in the Southern California territory, and since the Western Aircraft Show was primarily a dealer's show the manufacturers did not enter the picture to any great extent. For that reason there were comparatively few introductions of new models, and the entire effect of the show was to sell the public on the desirability of purchasing an airplane, not because it was a planes man's trade show, but because it was the next nearest, but because an airplane has become a highly desirable commodity of established worth of being a Department of Commerce License holder.

Since Southern California people are supposed to be usually air minded, they have been "airborne" to distraction, and the demands on the public to attend this airport opening at that time program has created a condition of mania toward things aeronautical. With planes of almost every description on display at fifty-air airports in Los Angeles county alone the local public had become so accustomed to viewing airplanes that the show management anticipated some difficulty in getting satisfactory attendance. As outlined in a preliminary article on the Western Aircraft Show published in the Nov. 9 issue of AVIATION, a great civic campaign was conducted in an effort to create popular interest. This campaign was a success and the public turned out



The Western Air League's extensive booth.

in grinding numbers with a very high percentage of real prospects among the show visitors. Final attendance figures for the nine days give a total of 70,000 paid admissions, which figure considerably exceeds even the lowest hopes entertained by officials of the California Aircraft Exposition Association and of the Aeronautical Chamber of Commerce of America when the show was first planned. Presumably the show more than paid for itself here, and net profit of approximately \$10,000, all of which money will be used to further the development of aviation and particularly of future aircraft shows.

## Exhibitors Show a Total of 57 Planes

**A**TTENTION was a national show, the Western Aircraft Show compares favorably with other recent aircraft expositions. A total of 57 aircraft was on display, exclusive of gliders, which is 17 more planes than were shown at the International Aeronautical Exposition of 1928 in connection with the National Air Races at Mines Field, Calif., and two more than were shown under the exposition building this year at Cleveland. Some interesting comparisons are offered by the planes shown. Of the 57 planes in the show, visitors were of western manufacture and 41 were built out of the Rocky Mountains. Of the Western planes thirteen were monoplanes and four biplanes, a figure four to one in favor of monoplanes for western manufacturers. The eastern planes, on the other hand, were divided into groups of 26 biplanes and only thirteen monoplanes. If the trend in design through the world is toward monoplanes, as it has seemed there the west, particularly at least, must be considered the most progressive section of the industry in developing new designs. Again, in

considering training planes, four of the twelve western monoplanes were two-place trainers, while but two of the fifteen eastern monoplanes were of the trainer type. There has been a definite swing toward monoplanes for training purposes, despite some reluctance on the part of the fly-by-the-seat biplane pilot, and it must be considered that the West, with the country's greatest number of students actually undergoing flight instruction, has here clearly indicated the progress of the monoplane for primary training.

As has been indicated, the real feature of the show was the advanced show presentation and the sales methods by which the public's interest in aircraft was inflamed and crystallized into a desire to own. The various dealers, knowing each other and familiar with the fact that the sales possibilities of the territory had already been pretty thoroughly canvassed, came into the show with no expectation of great immediate sales, and no one was disappointed. In order to make a satisfactory impression in a highly competitive exhibit, the various dealers prepared special show models such as automobile dealers have long been presenting at their shows. Some exceedingly beautiful paint jobs and thorough upholstery work were in evidence, and many of the exhibitors had gone to unusual effort to prepare attractive display pamphlets and to train young men as attendants in addition to the regular corps of waiters. Where a plane was merely placed in the show, without embellishment, it soon became apparent that the crowds kindly passed for a glance, preferring as they did to pore intently over the machines which displayed flashy jobs of green and gold, or crimson black, and white, with an upholstery and polished hardware. Among the most

*Increase in sales is the real test of an aviation exposition, just as it is in every other industry. The Western Aircraft Show recently held in Los Angeles was staged with this idea in mind, and dealers report surprisingly large lists of line prospects. In addition, the show netted a profit and the attendance was larger than expected. Some of the highlights are given in the accompanying article.*

showing "Show" planes were the five Great Lakes, each with a different color combination. Two of them were equipped with the new Gradyair Air Wheel, the Ercoupe "Challenger" and the Ercoupe "Cirrus" and the Ercoupe "Challenger" which were mounted in highly artistic green and gold finish; the two Cessna planes, a two place open trainer monoplaner finished in orange and silver, and the three place sales monoplaner finished in yellow and several shades of blue, red and violet; the Cessna Robin "Challenger" mounted in a mid-air flight position and finished in pale blue and silver after a striking pattern and the eagerly priced, Morland monoplaner, the M-1 three-place semi-cabin monoplane finished in blue and gold to resemble a beautiful bird, and the Morland M-2 trainer monoplane in blue and silver. That the extensive colors and decorative patterns took the public's eye was abundantly demonstrated and the manufacturers may well consider it worth these while in future not only to take pains with the paint jobs of "Show" planes, but to color and outline production models more attractively and distinctively. A prize for the best exhibit went to the Greater Monocline Company of Long Beach.

From the spectators' standpoint, the very satisfactory number of easily understood charts on the various exhibits offered one both the opportunity to rest occasionally, to talk over the merits of a particular plane in length and in comfort and to sit down and study various planes at ease. Another valuable idea which seemed carried farther than of any previous show was the



A line of planes behind the exhibit of the British Aircraft Corp. The Waco "Circus" is a Lockheed, and to its left a Fokker F-1 and F-2 and a Ryan Monoplane is in the background.



Col. E. H.  
Barnett, Di-  
rector of Air-  
ports for Los  
Angeles City  
and chair-  
man of the  
Conference

# ACCOMPLISHMENTS OF THE *All-Western* AIRPORT CONFERENCE

*Representative Group Meets in Los Angeles to Discuss and Speed the Solution of Western Airport Problems*

**I**N ACCORDANCE with the program of the Airport Section of the Aeronautical Chamber of Commerce of America the All-Western Airport Conference held in Los Angeles Nov. 2-3, was called primarily to bring together the leading airport executives of the western states for the purpose of forming a permanent organization to expedite handling of western airport problems. This plan is also being followed with other sections of the country. The various sections such as New England, Northwest, Middle Atlantic etc. long of the greatest help to the Airport Section of the national body as to subdividing the consideration of airport problems as to greatly speed their solution.

Properly the most important work of the All-Western Airport Conference was the adoption of reports by the By-Laws Committee and the Nominating Committee which set up the machinery for the functioning of the Western regional section. The by-laws as requested by chairman Woodruff DeBris of the by-laws committee and adopted by the conference stated that the organization should be known hereafter as the Western Airport Conference, a part of the Airport Section of the Aeronautical Chamber of Commerce of America, that the organization should function around an executive committee of eleven members, one from each of the eleven western states; that the chairman of this executive committee should be selected by the conference members; that the committee should meet at the call of the chairman; that the chairman should appoint certain standing committees in various sections of the territory for the consideration of special airport problems; and that two members of the executive committee should be selected as national delegates to the Airport Section of the Aeronautical Chamber of Commerce of America.

The report of the nominating committee, presented by Robert J. Prochard, Editor of *Hollywood Flying Magazine* named Col. Richard B. Barnett, Director of Airports for the City of Los Angeles as chairman of the conference. Colonel Barnett was also named as delegate to the national body and Arthur H. Abel, assistant general manager of Oakland Airport, was named as second delegate. Other executive committees were for Oregon, Seely Y. Hall superintendent

of Medford Airport, for Washington, David G. Lutz, manager of Boeing Field, Seattle; for Idaho, Hans J. D. Wood, Commissioner of Public Works for the State of Idaho; for New Mexico, William E. Heck, for California, Arthur H. Harty, for Arizona, Kerley T. Moore, for Utah, John Harty, for Colorado, Chas. D. Vail, Manager of Parks and Improvements for the City of Denver; for Missouri, E. E. Mottson; for Nevada, Capt. Roscoe Turner; and for Wyoming, Clarence Holladay. The report was adopted by the conference. That was set up the machinery and officers for the functioning of a body which will attack the very real problems faced by the west with its sparse population, rugged terrain and heavy air travel, incident to the establishment and successful operation of adequate airports.

## *Small but Enthusiastic Group at Opening*

**T**HE All-Western Airport Conference opened Thursday morning, Nov. 2, with a small but representative and enthusiastic group present. The total registration was approximately 60 persons, with at least one man from each of the eleven western states. Perhaps the most important accomplishment of the conference was the adoption of three resolutions at the close of the discussion periods.

The resolution of most significance to the western states was that presented by the Hans J. D. Wood of Idaho, and adopted by the conference, as follows:

"Since the workings of the nation may be exposed to serious risk similar to those of the railroads and highways both of which have required Federal aid and State in case of national emergency national airports become of prime importance, and

"Since disparity in distribution of population and wealth makes equitable and justifiable the assumption of total airport cost to each locality in which development is necessary,

"Therefore, the committee recommends that the All-Western Airport Conference approve the principle that the responsibility of developing adequate airport facilities in America, aside from private industrial enterprise, belongs to the Federal, State and local governments

"The committee further recommends that a commit-

tee be named to study the problems and work out a plan whereby the whole responsibility may be equitably and fairly apportioned among these various governmental agencies so that each may bear its fair proportion of the burden, and no more."

The suggestion incorporated in the last paragraph will be carried out by the new chairman of the conference and a report on an actual plan for equitable Federal and State aid will be presented in the near future. It is readily apparent that the West, with its comparatively small population and wealth, is more in need of Federal aid for an airport program than are most other sections of the country.

Another important resolution adopted by the conference was presented by Earle Ovington, chairman of the Uniform Airport Rules Committee, and which read: "Insurance on uniformity in Airport Rules is desirable and research as the Department of Commerce has issued

a Bulletin, No. 20 Oct. 1, 1929, on 'Uniform Rules for Airports.'"

"Therefore, he it resolved that this conference recommend that all airports use the Department of Commerce suggested uniform airport rules as a basis for Airport Rules and that a standing committee be appointed by the Western Airport Conference to take up these rules with all airport authorities in the Western States. This committee is also requested to advise with the Aeronautical Chamber of Commerce and the Airport Division of the Department of Commerce as to uniform signals and codes to be used to control traffic."

## *Summary of Revenue Classified*

**A** THOROUGH report was presented at the close of the conference by Arthur H. Abel for the Committee on Standardization of Airport Charges. The report was quite lengthy, going into all phases of airport revenue



The Western Airport Conference Assembly at the Hotel Alexandria, Los Angeles

in considerable detail. However, all legitimate sources of airport revenue were classified as follows:

1. Hangar rents.
2. Leases on ground with improvements.
3. Leases on ground without improvements.
4. Commercial charges, fees for the use of the port.
5. Office, shop, and locker rentals.
6. Cannaceous.
7. Landing fees.
8. Parking fees.
9. Fueling charges, taxi cabs, compass swinging platforms, etc.
10. Sale of supplies.
11. Charges for services of mechanics.
12. Charges for admission of public to the field.

The committee felt that the first three charges listed above should be based on the cash value of the port and improvements thereon and must be fixed on such a percentage basis as to allow for varying the cost of improvements, and eventually of the land itself. In addition, it was felt that private ports must find an added allowance for profits on the operation of the airport.

It seemed to the committee impossible to fix any exact schedule of charges on hangar rentals, but it was felt that charges should be on as simple a scale as possible and should be based on actual floor space occupied. It was thought that there should be no charge at all or a very low charge for the use of the airport, and that there should be no parking charge for spectators. The committee felt that it was not possible at this time to set up any standard basis of charges for the sale of supplies at the service rendered by mechanics, leaving these charges rather to the various local conditions to determine.

This report was turned up in the following words: "Your committee believes charges should be based on actual value given. That landing charges should be levied for the time being, that license and corollary matters be considered as being rentals of airplanes and similar facilities, that concessions comprising perhaps gas and oil, be handled on a flat-rate basis."

#### Arthur H. Abel Discusses Revenue

Presentation of all papers was completed on Thursday, May 7, with discussion of these papers being carried on during the several sessions that followed on Friday and Saturday. During the first morning session, presided over by William E. Hick, New Mexico papers were presented. Arthur H. Abel, assistant general manager of Oakland airport, presented a lengthy paper dealing with "Standardization of Airport Revenue" based on approximately two years of seasonal operation of Oakland Airport. Mr. Abel emphasized the fact that the Oakland port is a part of the general harbor development, administered by a non-political harbor commission, and that it has had to pay

its own way from the start. He said that land leases cannot pay airport costs, but that airport charges for various services must be relied upon to pay the costs of improvements and operations. Mr. Abel stated that the Oakland airport has lost the city approximately \$1,500,000 to date, but that the gross revenue for the fiscal year of 1928-29 will approximate \$80,000, and the net profit to the city will approximate \$25,000. Of this amount, 35 per cent was paid to come from hangar rentals. Commercial operation fees for the use of the field are placed on a sliding scale ranging from \$30 per month for two-passenger planes to \$70 per month for transport planes, during the winter months from December to March, while corresponding rates of \$45 to \$90 are charged during the months from April to November. Transport operators are required to register daily and to pay fees ranging from \$33 per day for planes carrying two passengers to \$69.50 per day for planes of more than six-place capacity.

Mr. Abel emphasized the point that there are but two exclusive concessions on the port, one for a 30-man hotel



Oakland (Hick) Airport, which in 1929 was the scene of the National Air Show.

which will bring it approximately one per cent of the total revenue; and another for the restaurant and lunch counter which brings in about seven per cent of the revenue.

Companies selling fuel and lubricants are required to install and operate their own equipment on leased ground and pay to the airport six cents on each gallon of gasoline and five cents on each gallon of lubricant sold, this source accounting for about three per cent of the field's income. Other revenue is obtained from miscellaneous sources such as charges for hangar lights, field flood lights, locker and tool box rentals, sale of water, garage and dock rentals (the airport occupies a navigable waterway), and tolls on staying telephone and telegraph messages. In closing Mr. Abel stated that these charges are resulting in an average net profit to the city of about \$3,000 per month and that the operators using the field are all well satisfied and making money.

Capt David G. Legg, manager of Boeing Field, Seattle, next presented a paper dealing with "Standardization of Airport Traffic Regulation" and based on Aeronautics Bulletin No. 20, Oct. 1, 1928. Captain Legg rather humorously compared the present air traffic rules to a condition in the world of football where every team might be permitted to make its own rules and a referee might be permitted to enforce them. He said that the rules

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under which the game was being conducted permitted stopping the men with the ball, or playing with 15 men as a side instead of 11. He also called attention to the present insupportable condition in connection with the operation of automobiles in that a driver may find varying regulations as to parking, speed, turning corners, etc., in almost every town visited during the course of an extended tour. Captain Legg suggested that in many cases it would be necessary for states to pass legislation on traffic due to the fact that certain cities or counties are not equipped by their charters to so function. He said that in requesting traffic adjacent to Boeing Field, King County, State of Washington, created a law which adopted the entire schedule of rules laid down in Bulletin 20, with only such additional clauses as seemed necessary to further protect the county, the airport, and the operators on the port.

One interesting point brought out by Captain Legg was that such things as topography may cause variation of the air traffic rules as promulgated by the Department of Commerce. He said that because of a ridge of hills near Boeing Field it had been necessary to call for a right turn when taking off into a south wind, and a left turn from the field when taking off into a north wind. A red flag in the day time and a red light at night, appropriately displayed only for the left turn, while green light or white flag is the signal for right turn. One phase of traffic regulation involving considerable attention, according to Captain Legg, is the development of more noiseless, battery electric signals, and the promise of less noisy lights which have such characteristics which will finally reduce the field at which the beacon is operating. In closing, Captain Legg made a strong plea for the uniform adoption of air traffic rules worked out by the Department of Commerce.

#### J. D. Wood Asks Federal Aid

THE AFTERNOON SESSION, presided over by Dr. Paul A. Carpenter, of Los Angeles, included the presentation of three interesting papers and one oral report. J. D. Wood, Commissioner of Public Works for the State of Indiana, made a strong plea for federal aid for airport

construction projects in his paper, "Who Should Build the Airports?" Mr. Wood called attention to the fact that the railroads were heavily subsidized by the government during their early period of growth, and that highway development is now being heavily supported by the Federal government. Mr. Wood also called attention to the continued operation of the Western States Aeronautics Board, of which he is treasury chairman, which was formed

in Salt Lake City, Aug. 26-27, 1928, and which board has urged the immediate adoption of airport building programs according to Department of Commerce regulations by all cities and counties insupportably equipped with airports. He further reported that the Aeronautical Chamber of Commerce of America, the National Aeronautic Association, the Grange Union, and the American Bar Association, all seem to be in agreement on four important questions concerning airports and air traffic, as follows:

1. That aircraft should carry United States licenses only, and not be required to carry a license from each state operated in.
2. That some new stamp tax, perhaps a tax on aviation gasoline, should be used to raise money for airport development.
3. That air traffic rules should be left to the Aeronautics Branch of the Department of Commerce for solution.
4. That air transport operations are too young for any attempt at rate control, or regulation.

Mr. Wood said that he could visualize the airport program of Congress would grant funds and authority for federal co-operation, since such an action would result in the immediate development of state and interstate surveys based on systems of allied airports, with the Secretary of Commerce, the Secretary of Agriculture, and all State Highway organizations available for assistance in developing the needed fields. Mr. Wood closed with an earnest plea for the early adoption of some general plan calling for the provision of adequate ground facilities for aircraft operation in greatly increased numbers.

Woodruff De Sales, assistant director of airports for the city of Los Angeles, presented a long paper on "Marketing the Airport." He emphasized the importance of the right publicity and advertising, the proper treatment of the public, development of field facilities, and beauty of field equipment and buildings in order that the general public may be brought to the airport in greater numbers to patronize operators using the field.



The Oakland, California, Municipal Airport as it appeared just before completion.



Mr. De Silva asked the delegates to particularly note the uniformly attractive Spanish architecture which has been used on all buildings erected on the Los Angeles Municipal Airport, stating that he thought this the first serious effort that had yet been made to establish a uniformly high standard of architectural beauty for buildings on an airport. He said that this beauty of surroundings at the field, coupled with the proper treatment by field officials, was of the greatest help to field operators or aircraft distributors in closing prospects for plane services or sales.

Mr. De Silva stated that the city of Los Angeles plans extensive betterment, repaving, and direct and subdividing of the facilities available at the new municipal airport, that monthly dinners for aviation executives are to be held at the port, and that good will air races in which no starting is permitted are available for building airport patronage to the town's visitors. He also emphasized the fact that an airport's reputation depends upon the manner in which visiting pilots are treated, and that it is important to send all pilots away from the airport with the best possible impression of it. Mr. De Silva closed with the thought that airports at the present stage of development need every possible form of publicizing and exploitation in order to attract public notice and bring added business for aircraft operators.

An oral report on the development of the Army primary training field at March Field, Riverside, Calif., was given by Capt. W. J. Harper.

#### Character Operators and Management

THE FOUR ATTENTION-DRAWING and presentation of papers to the conference closed with an excellent paper on "Relation of Aircraft Operators and Airport Management" read by Walter D. Waterman, general manager of the Los Angeles Metropolitan Airport. Mr. Waterman grouped the various operators as: transport companies with large fleets of aircraft, air service companies, with fleets of smaller two planes, schools, doctors and distributors, manufacturers, private owners, and business owners. He brought out the difficulty of accom-

modating such a wide range of airport users and the necessity of so operating the airport that all users of it can turn a profit, thereby making it possible for the airport management to realize a profit. One outstanding suggestion by Mr. Waterman was that the operators themselves might be organized to enforce airport rules by means of an informal kangaroo court, thus saving the airport management considerable underpayment in some circumstances and avoiding friction between management and operators. He pointed out that under such an arrangement the airport management still has the authority to step in and punish a serious offense. Mr. Waterman advanced positive statements of all operators with the management, urged the actual co-ordination of rates and charges by individual operators on an incentive to improving the appearance of the field and expressed himself so opposed to the granting of any exclusive cases soon or privileges on the part.

Friday's sessions were held at Los Angeles Municipal Airport in the forenoon and at the Western Air Exposition Hangar located on the Alhambra field, in the afternoon. General discussion was conducted on all papers presented to the conference. P. D. McNamara, of the Los Angeles Bureau of Power and Light, engineer in charge of installation of lighting equipment on the Los Angeles Municipal Airport, urged that all lighting standards be referred to the engineers of public utility companies who have all the necessary data at hand and will gladly co-operate in an unbiased way on the solution of such problems.

Mr. Robert Fitzthum asked about the eventual laying of a landing fee at airports and Mr. Andrew Abel stated that he thought it would become general practice in the future, although not now regarded as a likely source of airport revenue. C. A. Campbell asked about the wisdom of emergency admission to the flying field for special events. Mr. Abel replied that this could be done at the Oakland Airport and he thought it poor public appearance unless for some event such as the National Air Race program. Mr. Earle Gougeon suggested that one-plane hangars with individual padlocks, each with a key and the owner, seemed to be that there is no demand as yet for such a service.

In discussing traffic regulations, Mr. Fitzthum asked about the possibility of developing an automatic semaphore system to replace flagmen on the runways. The general opinion was that flagmen are unreliable and a computer was appointed to study the problem of proper signals. Smoke pots as wind direction indicators were suggested and the conference agreed that the need for a uniform type of tail sled shoe be brought to the attention of the manufacturers, it being suggested that some combination of the tail wheel and sled shoe be worked out to eliminate tearing up the runways except in emergencies requiring quick stop.

The third day of the conference was devoted largely to an inspection tour of Los Angeles County airports including the Los Angeles Metropolitan Airport, Glendale Airport, and Grand Central Air Terminal. An official reception at the Western Aircraft Show concluding the work of the conference.

With the early appointment of standing subcommittees to study and report on airport problems and with the appointment of two delegates to the next annual airport conference in Buffalo, it is believed that this first Western Airport Conference has been a giant stride forward toward the establishment of adequate ground facilities for aircraft operations in the western states.

## THE *Hall* SHIPBOARD FIGHTER

*Wasp Powered XFH-1 Embodies Fuselage Designed for Emergency Flotation and Other Safety Features*

By LESLIE E. NEVILLE

*Technical Editor of Aviation*

IN ORDER to meet the demand of the Navy Department for a shipboard fighter embodying the principle of emergency flotation and other safety features, the JRF Aircrafts-Armstrong Corporation, Buffalo, New York, has developed the XFH-1. This design, which was worked out in cooperation with the Bureau of Aeronautics, was recently completed, and has been undergoing a series of test flights. The XFH-1 is

a single seat biplane of conventional arrangement for this type of service, but having a number of noteworthy constructional features. Another interesting feature in addition to the watertight fuselage is a means of quickly dropping the landing gear in the event of a forced descent on the water.

The XFH-1 is powered with a Pratt & Whitney Wasp engine and complex military equipment is included



Grand Central Air Terminal, Glendale, Calif.



The XFH-1 Shipboard Fighter, powered with a Pratt & Whitney "Wasp" engine

in the installation. The airplane has a wing span of 32 ft., an overall length of 25 ft. 6 in. and an extreme height of 9 ft. 3 in. The weight empty is 1,755 lb. and the gross weight 2,514 lb. The structure is built entirely of metal, aluminum alloy being used in all principal parts. Wings and tail surfaces are covered with fabric. The general type of construction is the result of a number of years research by Charles Ward and Archibald M. Hall, and is used by various other manufacturers. Several characteristics are noted in this design as well as in the general methods of construction adopted by the Hall

Company. Among these are the wide use of sheet metal stock and drawn section members, and the success with which accessibility for riveting has been obtained. Recently also is shown an obtaining concentric loading and balancing not secondary stresses in the structure.

A considerable saving in weight is attained in this design due to the careful proportioning of the individual members. This saving is not attributable alone to the substitution of aluminum alloy for the more metal forms of construction but is the result of thorough consideration of all principal structural members with the object of obtaining unnecessary material whenever possible. The principal members have been designed to resist stress reactions to which they may be subjected in service and, what is more important, even the smallest details in the design of the airplane have been given the same consideration.

As previously mentioned secondary stresses have been treated with extreme thoroughness with several pointed objects in view. The design takes advantage of every opportunity to balance one secondary stress against another to reduce the effect of both. Wherever stresses of this order could not be utilized to advantage they have been eliminated in some cases by the use of full concentric joints and in others by controlling the curvature of the gravity axis of members subject to combined side load and end load so as to eliminate the effects of side stress action.

At certain points secondary stress has been introduced to relieve the free edges of open hollow sections or to control the plane of flexure of unsymmetrical sections. The effective strength of members has been enhanced through restraint or bracing of their web in nearly all cases where the deflection of the entire truss under load would then result in double curvature of the member. In cases where single curvature would result and forcing has been avoided. Several examples of this principle will be shown in detail later.

Very gradual changes in length, width or moment of inertia in the members of trusses have been maintained and forms allowing high tensile stress while also embodying a large ratio of length to width have been used. Each web member has been arranged to form an integral part of the entire truss. The various truss members have been proportioned for single intersections and to approximately constant triangles. Similar as previously, however, the chord panels have been reserved for members that are most highly stressed in compression.

Wherever practical round tubing has been used for

structural members while in other cases the form of section most efficient has been used.

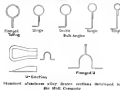
The ribs consist of spun built up of aluminum alloy webs and ribs blanked and pressed from 1787 Alclad sheet. Trailing edges and nose stiffeners also are of aluminum alloy. The tail surfaces are similar to the wing in general construction except that the spars consist of a single tube instead of the multi-tubular truss used for wing spars.

Wing spars are formed of a plurality of tubes and the web members are also of tubular form fitted at the ends and riveted to the chord members. The rear of the spar depth to spar width is related to the wing chord lift and the drag force is carefully maintained. A high efficiency is therefore attained by mere form of cross section.

Wherever in a truss or lattice column the diagonal web system introduces at a rectangular point, the secondary stress in the chords adjusting the panel is very large and infrequently being 100 per cent. of the primary stress. This is due to the weakening of the column under load which accompanies its shortening. The diagonal web system has no tendency to restrain this weakening but a rectangular panel effectively prevents it, and so produces a large bending moment in the half panel adjoining. The panel joining plates of these trusses are of Y form obtaining any half panels and permitting of the attachment of lift and drag bracing to the spars without interruption of the continuity of the diagonal web system. This deviation of a large secondary stress, otherwise present, allows the use of lighter members for the spar chords. Incidentally the weight of joint plates is also much less.

Reduction of area of the chords where less stressed under combined side and end loads is provided, for an upper spar, the reducing of the lower chord area near the spar and of the upper chord area near mid span. For a lower spar under such combined load the upper chord is reduced at the support and the lower chord near mid span. This is accomplished by varying the number of tubes in the chord members of the spars. Such variation in area between upper and lower chords results in a shifting of gravity axis of the spar section to a position away from its position of symmetry and nearer to the larger chord. In other words, the gravity axis of the spar has been cambered along the spar length in the same way as if the spar were built in a curved form.

In the condition of pulling out of a dive the lift load tends to straighten a spar constructed in this manner between its airplane supports. If the spar has been correctly proportioned it will be quite straight when the



extended maximum load factor has been reached. Thus the column bending moment subsists due to the product of end load by the eccentricity from antisense deflection has been eliminated.

Tests show that in rounded spars of this type the ultimate load sustained is not appreciably at the yield point as indicated by permanent set after the removal of a load increment. On the contrary these spars will sustain at failure 40 to 50 per cent more load than was required to produce the first well marked permanent set.

The principle of preventing failure by column action through a shifting of the gravity axis is also conceivable



in the gradual variation of the width of the web members in the rib truss. These members are of parabolic cross section approximately 55 deg. angles. The apex is kept straight and the web is upset at its intersection with the chord sufficiently to carry the gravity axis on the chord flange. This arrangement results in a gradually curved gravity axis of the web member on the chord flange ending, as the load is applied, to increase the compression at the apex of the section and to release the apex so that they will not buckle. The large flat ends joining the web members in the chord flange afford through their rigidity a considerable end fixity to both.

Further reinforcement against buckling is used for the rib chords, the outer flanges of which are continuously braced in a panel joint. Such bracing is about 16 per cent to the ultimate strength of the entire rib.

The ribs as a whole are of 2 sections and asymmetrical. Instead of spring them to a plane perpendicular to the wing panel they are set at an angle of



The rib flange used in the drag bracing of the wing structure. Above—Attachment of a string to the multiplexed spar.

Right: Method of wing structure showing spar and rib construction, and drag bracing.

Below: The increased wing panel structure, while the variation in the section of the gravity axis of the chord members of the spars.



88 day, thereby the object of this being to check failure in the lower wing panel structure the front spar chords are  $\frac{3}{4}$  in. in diameter, 0.035 in. wall, while rear spar chords are  $\frac{3}{4}$  in. in diameter x 0.032 in. wall. There are three tubes in each chord for the most highly stressed portions and two tubes for those less highly stressed. The spar web members are of 1757 tubing  $\frac{1}{2}$  in. in diameter, 0.038 in. wall and  $\frac{3}{4}$  in. diameter, 0.038 in. wall. Ribs are blanked and pressed from a 0.024 in. thick 1757 Alclad sheet. The tips and trailing edge are of 1757 tubing  $\frac{1}{2}$  in. in diameter and 0.048 in. wall thickness drawn to oval form. Nose stiffening is of 1757 Alclad sheet 0.065 in. thick.

The length of the panel is 12.95 feet and the chord 48 in., and the area 50.7 sq ft. The weight per sq ft of structure is 9.652 lb. Detailed weights are as follows:

Beams—front	6.70 lb.
Beams—rear	6.21 lb.
Trailing edge	37 lb.
Ribs	6.25 lb.
Drag struts	58 lb.
Drag wires and terminals	1.10 lb.
Fronting drag wire	4.30 lb.
Nose covering	25 lb.
Wing up bow	80 lb.
Braces	1.75 lb.
Protective coating	26 lb.
Cover	1.23 lb.
Decks	5.60 lb.
Wallops	1.50 lb.
Range pins and caps	34 lb.
<b>Total</b>	<b>42.75 lb.</b>

Ribs are of Clark Y airfoil section, weigh 0.205 lb. each and support a load of 593.3 lb. in high incidence conditions. Ailerons are mounted by a constant bearing on their spar surface. The fabric covering on the panel is drawn into a slot on the under surface with a wire and no further sewing is necessary to secure the fabric.

Drag bracing consists of tubular struts provided with spherically capped end fittings each of which engage the upper surfaces of a double ball head bolt. Drag wires are attached to a forward and spherically capped strap, the exterior of which fits

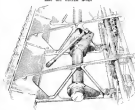


The construction of trailing edge stiffeners

across the ball surface of the bolt which is passed through drilled holes in the strap and spar joint plates and secured by a nut. The larger ones of these fittings are termed front-lugged bar stock while the smaller ones are blanked and pressed from sheet 0.03 in. thick. The double ball head bolts have been hot forged to size or turned from round stock. The first method is very economical when compared with the first cost of dies. Drag wire straps are either blanked in dies or sawed to outline in blocks of ten or twelve thicknesses and then pressed to fit to cap them to a fit with the spherical underside of the bolt head. After this the round holes are drilled. These straps are attached by attaching very full and flange to the drag struts and by eliminating bending moment in the bolt and



Shows the attachment of the struts to the wing structure. The front and rear spar chords are shown. The drag struts are attached to the front and rear spar chords. The drag wires are attached to the front and rear spar chords. The drag wires are attached to the front and rear spar chords.



adjacent spar, also shown in the joint plates, result in very considerable saving in weight.

The drag capping of the strap and the widely spaced points on the rim of the cap from which the struts fork lead, cause the line of action of the drag wires to enter the bolt axis at its bearing on the spar. Tests show that this arrangement takes an ultimate load by shearing of the bolt without perceptible bending. Since the spar joint plates are free from torsion, they, as well as the spar chord, may be lighter.

Bearing of the drag strut fitting upon the upper surface of the bolt results in pressing them into perfect contact as loading is applied and, from the resulting friction, a fixing moment exists. This fixing moment increases in direct proportion to the end load and is in fact numerically equal to the constant product of the coefficient of static friction by the radius of curvature and by the end load. The fixing moment for any end load is thus computed definitely. On tests of the drag struts used in these wings this frictional fixing moment

was sufficient to reduce a K factor to the haler thirds of the 3 to 3.25, the value being only conservatively straight. This is a higher factor than can usually be obtained by testing with carefully made flat cables. Under loading, each long strut ( $1/2$  ratio = 118) remains practically straight up to the failing load and, when the friction is overcome, they jump suddenly to a curved form and continue to sustain a Euler factor of 1 while so bent. When this load is removed the strut becomes straight and may be reloaded repeatedly with the same result.

The fitting for the lift wire anchorage in the upper wing is also of interest and together with joint plates weighs 1.2 lb. Load in the lift wire is carried through to both flanges of the spar while the drag load is also carried through Y plates and a lower screw lag carries the load from the lift strut. The fitting is so designed that a standard wire tie rod terminal barrel can be inserted in the hole and the two wires are secured into the barrel in such a way as to leave very little of the fitting in the air stream. All lift and drag loads are consequently passing through one point in the fitting. The barrel arrangement allows the wire to slope itself, insuring a straight load.

The lift wire anchorage on the fuselage is a 1757 forged fitting through which the wires extend and screw into a standard barrel used for strap end fittings. Look at the side of the fuselage and you will see the wires are set against the barrel and do not rest on the sides of the holes in the 1757 fitting. The 1757

fitting is riveted to the skin and frames. There is also a plate between the plate and the skin, the latter being riveted to both sides of the bulkhead and to the stringer. The continuity of the transverse frames is maintained by the skin which is riveted to the flange.

The dimensions of the material used on the fuselage follow. The skin or covering is 0.24 in. thick 1757 Alclad sheet. The flange "U" shaped reinforcement on wing box frames is standard section  $\frac{1}{2}$  in. x 0.035 in. 1757 Alclad sheet. On standard transverse frames are flange tube sections  $\frac{1}{2}$  in. diameter x 0.030 in. thick and webs are 0.038 in. thick 1757 Alclad sheet. The bulkhead wing box frames are  $\frac{1}{2}$  in. diameter 0.024 in. thick 1757 Alclad sheet flange tube section, while the webs on these frames are 0.030 in. thick Alclad sheet.



Shows the attachment of the struts to the wing structure. The front and rear spar chords are shown. The drag struts are attached to the front and rear spar chords. The drag wires are attached to the front and rear spar chords.

riveted to gussets and angles formed from Alclad sheet. Longitudinal bracing consists of struts of hollow ball pipe section of standard 1/2" tube passing through the transverse frames. Both the transverse and longitudinal bracing are riveted to the Alclad sheet forming the skin or covering for the fuselage. The fuselage is water tight providing enough buoyancy to float the airplane fully loaded.

Both longitudinal and transverse frames are continuous from end to end. The longitudinal stringers pass through holes in the transverse frames and in the water tight bulkheads. These stringers are made waterproof at the bulkheads by a cork inserted in the hole and by clips riveted to both sides of the bulkhead and to the stringer. The continuity of the transverse frames is maintained by the skin which is riveted to the flange.

The dimensions of the material used on the fuselage follow. The skin or covering is 0.24 in. thick 1757 Alclad sheet. The flange "U" shaped reinforcement on wing box frames is standard section  $\frac{1}{2}$  in. x 0.035 in. 1757 Alclad sheet. On standard transverse frames are flange tube sections  $\frac{1}{2}$  in. diameter x 0.030 in. thick and webs are 0.038 in. thick 1757 Alclad sheet. The bulkhead wing box frames are  $\frac{1}{2}$  in. diameter 0.024 in. thick 1757 Alclad sheet flange tube section, while the webs on these frames are 0.030 in. thick Alclad sheet.



Top Left: View of the structure used in the construction of the fuselage. Left: The joint of the lift wire anchorage. Above: The profile covered fuselage structure.



while retaining excellent toughness. The cost of heat treatment, either of standard tubing in long lengths or of fabricated parts, in reasonable quantities, may be taken at an outside figure, at 30 cents per lb.

Suppose now that a given aircraft tubular member weighs one pound per foot and costs 30 cents per pound, therefore 30 cents per foot. By heat treatment the



The reduction of steel tubing. Four tubes of equal strength. 10.55 10.55 10.55 10.55. A heavier strength increased from 10.55 to 11.00 11.00 11.00 11.00.

strength can be doubled, or raised to 100,000 lb. per sq. in. For the same strength the tube need now be only half as thick as before. It will therefore weigh only 15 cents per ft., so that a saving in weight of 50 per cent. has been achieved for this particular member. At a heat treating charge of 30 cents per lb., it will cost only 15 cents per ft. to heat treat the tube, making the total cost the same as that of the untreated tube, or 30 cents per ft. One-half of the weight has therefore been saved without cost.

Assumptions	Untreated	Heat Treated
Ult. strength lb. per sq. in.	50,000	100,000
Weight per foot	1 lb.	1/2 lb.
Material cost per ft.	30 cents	15 cents
Heat treating cost per lb.		30 cents
Total cost per ft.		30 cents
Weight saved		50 per cent.
Cost of weight saved		\$0.00

It is well known that as certain aircraft parts coming under the head of heat treatment the structural strength of the member is determined not by the tensile strength but by the elastic modulus of the material, so that heat treatment in such cases is of no value and a low carbon steel is as good as a heat treat alloy steel of high strength.

But in a great many instances fabrications of certain members of moderate length occurs in detail, by buckling of the wall. Here the strength produced by heat treatment is highly advantageous and contributes largely to the

structural strength of the member. For example, two aircraft seats of standard tubing were recently tested for the Bellanca Aircraft Corporation. One was in the normalised condition and the other was heat treated to a tensile strength of 200,000 lb. per square inch. The dimensions were as follows: Minor Axis, 1.24 in.; Major Axis, 3.46 in.; Length, 53 in.; Wall, .065 in. They were tested as per end conditions. Failure in both cases was due to buckling of the wall. The results follow.

	Normalised	Heat Treated	Deflated
Load at start of first buckle pounds	11,900	26,000	27%
Load at ultimate strength pounds	12,400	31,400	25%

For members in which the principal stresses are tension, compression, or shear, the unit strength of the material is the determining factor.

The cost per pound of tubing ordinarily increases with a reduction in wall thickness, so that a certain increase in the cost per foot accompanies a reduction in weight achieved by heat treating to high physical properties. Furthermore, while a strength of 70,000 lb. per sq. in. can be used in certain parts, such as axles and large tubular members, there are other parts in which the designer will be more likely to specify values of approximately 150,000 or 175,000 lb. per sq. in. In such cases, of course, the saving in weight will be less than 50 per cent., although still large.

A few examples based on the actual cost of tubing purchased in quantities of not less than 500 ft. and including the cost of heat treatment at 30 cents per lb. have been figured and are given in the accompanying table. Examination of the figures will be enlightening to many who have not heretofore studied the matter from this angle. The cost of saving a pound of weight will be seen to vary from merely 41 cents (actual net saving) to 48 cents, over a fairly representative range of sizes and stresses.

The value of the saving of a pound of weight in the structure of an airplane is subject to wide differences of opinion. Even the most pessimistic will readily grant that it is worth a dollar to save a pound. An English designer made the closest estimate that he would spend a pound to save a pound (meaning, of course, a pound sterling or 95¢). Other estimates have been placed as high as \$25 a pound. The Army Air Service may, in some cases, apply a penalty of \$10 a pound for excess weight on contract jobs. One builder of large planes figures a value of 33 per pound saved. Based on any of these figures, the savings in weight producible by the use of heat treated alloy steel are extremely profitable.



Heat-treated steel wing frame that saved 30 lb. of aircraft weight.

## Unit Production versus Assembly of Purchased Units in Aircraft

### LOWERING

## MANUFACTURING COSTS BY

By CHARLES F. McREYNOLDS  
Pacific Coast Editor of Aviation

## Specializing Production

AFTER TWO YEARS of steadily rapid growth, during which production has each year doubled, the aircraft industry is still widely divided upon basic production problems. There are apparently two schools of thought, one which contends that aircraft are a low upon themselves and should be built complete in one plant, as nearly as this is possible, while at the opposite end of the scale we have these manufacturers who posit that airplanes are assembled from many separate units, each of which presents production problems of its own, and that wherever practicable these should be "farmed out" to specialists equipped to produce their effects.

Several Western firms have strongly adapted the latter policy, and suitable examples are available of economies

effected by this scheme. In some cases the cost of certain units has been reduced to one-fourth of what it was costing the airplane builder to produce the same thing within his plant.

The Golden Eagle Airplane Company, after extensive experiment with a coaching department, has found that it can have savings built in specifications at one-third the former cost.

This company also has found it much cheaper to have wood wing spars coated and finished at the mill, and is planning to let out contractors for the construction of aluminum tanks, and circulation bracket seats used in the Golden Eagle "Club". R. C. Doss, president of the Golden Eagle Company, plans to extend this policy wherever possible and hopes to lower production costs by contracting for the manufacture of ribs, undercarriages, flying and engine controls, and other such items, by outside companies. He points out that engines, propellers, tires, shock absorbers, wheel and brake units, instruments, radio cabin furniture, hardware and small parts, are all being produced and supplied in the trade by manufacturers who specialize in such lines, and that



Division of a factory unit devoted to the production of spars and wing assemblies.

it seems logical to hope for the production of completely loading gears, wing ribs, spars, control surfaces, etc., by such organizations, at considerable savings to the aircraft builder.

This plan of dividing professional into its component parts and having them, turned out, wherever possible, be cooperative which operates in such work, presents significant benefits for mutually lowering production costs throughout the industry. It is hardly conceivable that a single manufacturer can supply his factory and train his personnel to produce units which involve the workers of metal, wood, and cloth, with the various attending high expense of sewing, gluing, nailing, riveting, bending, bolting or welding as cheaply as this work can be done if turned over to organizations already equipped for it and trained to handle it.

Over preindustrial progress has been made possible by dividing the division of labor to its highest power. Each of our modern industrial units is dedicated to the production of some certain production product in mass quantities. The division of labor is the source of the specialization of nothing but such, or labor, or man, and within each of these factories we know that the work is departmentalized, and within each department, as far as possible, each man is trained to do only one thing. The product is produced in the most complete product sense, and the worker takes the world's best engineering lessons approximately 20 years to produce a manufacturing commercial airplane from the first early flying machines. The problems of engineering are just as involved in the design of design manufacturing. The problems of these problems to be solved overnight, nor to be solved within a single organization. It requires a life time of study to learn how to properly plan, design, operate, and produce. We know that costs are in most cases necessarily reduced, and that the cost of production is that a given operation is duplicated. Therefore it is necessary to find aircraft builders leaving over certain of their roles to manufacturers who are specialists in that particular work, and who have studied in great detail the problems of design, and who are turning out the results in quantity.

**T**HE HAMMOND LUMBER COMPANY, Los Angeles, has made an exhaustive study of the requirements of aircraft manufacturers, the result of which has been the establishment of an aviation department under the direction of R. E. Minnier. Within this department a crew of men is maintained which does nothing but produce wood parts for aircraft and which is trained to meet the exacting requirements of Department of Commerce inspectors in better advantage than is possible within the usual wood working plant which an aircraft builder



With more

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schedule of six planes or more per month. In one case, an airplane builder found that the spurs alone for a standard plane were costing him \$250 per set per hour he had equipped his factory for their production. The Hammond Lumber Company produced the same spurs for the manufacturer's line items for \$175 cost to the manufacturer on the first single job and this price could have been materially slashed on a quantity order.

The violation of turning over such types of information to the specializing companies is made apparent in this case for if but one or two aircraft builders were to purchase the Hammond Lumber Company it would not be possible to maintain an aviation department. On the other hand, if all such work in the territory served by this company, were to be given to this special department it would be possible to effect great saving in overhead and raise these on to the price of the combined aircraft.

**L**A. FRAGA-GIL, wood puts the small stream in balance. It is handicapped at a number of points. He must buy his raw lumber at comparatively weak logs and pay to have them shipped to his factory by rail, and to have the lumber stored by hand labor. His main asset has wood himself and such material as is discarded is likely to prove a total loss, for he cannot see how to find a larger market, approximately 90 per cent of all wood used in sawcraft. The small sawmill is handicapped in many ways. Sixty per cent of the best spruce available can be used for square, it is evident that the small manufacturer is faced with a 60 per cent loss. In actual production he must start from \$10,000 to \$20,000 worth of machinery, much of which will be idle part of the time, and he must count a tree, of woodworkers to perform all the various operations. The small sawmill is handicapped because it will not be enough of any one kind of wood to keep out most large on one millsite at all times.

On the other hand, taking the Hainsworth Lumber Company as typical of the Average large lumber wholesaler and retailer, we find that this company owns its own timber, saw mills, lumber warehouses, storage and handling facilities. Airplane spruce is selected as a matter of routine by company experts at the saw mills. Shipping is chiefly accomplished by means of oceanous vessels, and handling is by giant cranes on and off the wharves. The company also has a fleet of rail cars, and its company's storage yard, clearing and sawing plant in every aspect. Within the yard this company stores lumber many months in advance of the market and thus properly arranges all stock.

Production is simplified by the fact that all machinery is available in the mills and because aircraft parts are made in interchangeable quantities it is possible to specialize the mechanics and to keep the mechanics busy at all times. Would not similar facilities for aircraft use be economically con-

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varied to parts for motor boats, automobile bodies, furniture, etc., without any appreciable expense.



increased life span

Furthermore, when an aircraft factory is on a regular production schedule of a plane a week or more, it is possible for the mill to maintain a stock considerably in advance of the factory's requirements. The advantage of this inventory stock is doubly appreciated if the aircraft builder's planes in service should suffer crash damages requiring immediate repair which involves the replacement of wood parts drawn from stock. If the aircraft builder were forced to manufacture this stock it would represent a considerable expense to him.

An additional service which the mill renders is to maintain a reserve stock on important parts of planes which may be useful in use, making it possible for the dealer in that territory near the mill to draw on such stock without being forced to carry the parts in quantities as small as his own expense.

Another interesting development is that of the Aeratus Products Corp., Los Angeles, which turns out seat-rails of various types, bidboards, wing tips, and control surfaces. Several Western airplane builders have made use of Aeratus products and W. E. Harburt, president, has announced that an Eastern factory is planned to meet the demand of some of the larger aircraft builders for Aeratus products.

Wing ribbed riveted stainless steel and of bronze casters joined plate steel are produced by the Australian company and by specializing in the problems involved in this type of work it has been found possible to materially lower costs. Further concerns are possible because of the fact that many airplanes use the same short and wing nerve and it is possible to build up a stock of the most popular wing ribs. Where larger dimensions or locations vary it is a simple matter to meet the requirements of an individual company by means of an adjustable master jig which is used in assembly.

As production of the more popular types of ribs increases it is possible that the cost of such ribs can be lowered and that in some cases manufacturers will find it practical to alter their designs sufficiently to mount a standard rib rather than to pay a higher price for a rib made to order. The advantage of such a practice from the service standpoint is also apparent.

This brings up the point of standardizing unit aircraft and it is evident that sweeping economies can be effected if such members as spars, ribs, stringer leading, gunwales, wing tips, control surfaces, and other parts, can be standardized to some extent throughout the industry. These are many apparently innumerable problems to be solved before any such standardization becomes practical, but just as all automobiles are built with screw-in doors, so all aircraft can incorporate certain common features which will make the quantity manufacture of certain portions of the finished product a more economical



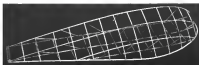
As shown in Table 1, the  $\alpha$ -value is the average of various types of  $\alpha$ -

A step in this direction has been taken by the Aeroquip company in the development of wing tips and control surfaces. Aeroquip ribs and wing tips have been used in the new Controlnet before while Aeroquip ribs and control surfaces have been adopted by the Rochester Corp. While this is a comparatively new field of development, Aeroquip officials report that they can turn out these parts to the manufacturer's requirements for less money than he can build them himself, and that in some cases they can save between seven and 10 percent.

The Rockwell Corp. is now testing a new type of wing and is satisfied with the tests plans to manufacture the wing only and supply it to aircraft manufacturers. This wing would make use of Aerostar ribs and elements, other parts of the wing to be fabricated by the Rockwell factory, and it is thought that the completed wing can be supplied at a lower cost than the manufacturers are now paying, because of the concentration upon their one craft.

**I**F A CRAFTSMAN would insist that whenever the production of a new unit requires a considerable outlay for equipment and calls for the exercise of a technique substantially different from that involved in the basic production of designing and assembling the airplane, that this particular job should be turned over to some organization better equipped to handle it, if there is such a one. Such organizations would not, and do not, depend entirely upon the aircraft industry for support, and financing of their operations. They would be the kind of manufacturing organizations such as tinners, welding, sign-makers, or wood parts. On the other hand, where a manufacturer handles his own units he is faced by serious losses if he changes his design. If he lays wood apart from the mill it means only the loss of a comparatively small portion of the craft's total business if he decides to buy metal parts from a metal part manufacturer. If he builds his own wood spars and decides to develop a new type of wood spar we know that he must underwrite heavy losses.

The whole problem amounts down to a matter of equipment and experience; and if the experience of these Winers' concerns is any criterion, it would seem reasonable for the average aircraft builder to have the equipment and experience to meet all the problems involved in the production of all the results which go into his completed airplane. If we are to attain efficient aircraft production we can well make use of all the knowledge and equipment of all the industries which can be applied to the production of aircraft. If we are to do this, we turn over the problem of metal working, wood work, e.g., special structures, tank construction, and many others of the sewing airplane production puzzles, to those best prepared to solve them, the sooner we may hope for lowered production costs, increased sales, and efficient



Walt staid wien he doordien by Aerona Poulton's farmstee.

## GENERAL NEWS

Feet Cites  
Lack of FundsAnnual Report Appeals  
For Air Base Improvements

WASHINGTON (AP)—In his annual report to the Secretary of War, Maj. Gen. James K. Probst, Chief of Engineers, stated that lack of funds prevented very necessary changes and developments that should have taken place at many of the air stations. Although appropriations for the year 1959-60 will provide the funds allocated on the five-year program, the shortage of money which the department has had to put up with for the past four years, will not be rectified before 1961-62.

In the course of his report, Major General Probst emphasized the need for strengthening the Air Corps reserve, especially the ground of pilots who would be the first called upon in case of war. Only 5,000 of the present 8,000 reserve pilots could be qualified for duty, whereas a total of 4,000 should be kept in readiness. Of the 5,000 only 2,000 would require additional training before they could be used in combat.

## Normal Developments Required

Long cross-country flights to places as distant as the Panama Canal Zone are planned for the coming year to be participated in by lieutenants, lieutenants and pilots, according to the Air Corps head. These trips will be made in preparation for contingencies of air and sea, because there is no alternative.

In the course of his report, Probst announced the following developments: The development of a military transportation squadron, which is progressing satisfactorily to sustain transportation of a number of these units. Each system development has resulted largely in improving existing equipment and introducing new planes substituted by manufacturers.

Ignition development centered largely upon developing a satisfactory method of stabilizing the ignition circuit and engine plans to provide radio interference.

## Described Techniques

The use of atomic radio receivers of greater sensitivity has demonstrated results in stabilizing engine operation.

General development of power plant transmission techniques can be controls, control systems, fuel and oil tanks, oil and water oil separator regulators and engine negative pressure.

Study of engine vibration and the production of a satisfactory indicator device are being continued.

Below are some further excerpts of

Added Hours;  
Fewer Mishaps

WASHINGTON (AP)—The Air Corps reported that the number of mishaps at the end of the year was down, but the number of flying hours was up.

Between July 30 to 100 for the year, only only 30, the number of accidents is down, the number of flying hours are less than 30 each twelve months. In the course of the report, it was also stated that there is a marked reduction in the number of mishaps attributable to mechanical causes.

The data furnished, reflecting mainly on conditions caused by lack of funds.

Mishaps in the number have resulted in a poor condition of aircraft and crew. The Air Corps has been unable to provide the number of maintenance and production of aircraft, but the number of mishaps is down to 30, the number of flying hours are less than 30 each twelve months.

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## New Bremen Field Aired

During the past year there has been much interest in the new Bremen Field, which is now being built. The field is located in the town of Bremen, Ohio, and is being built by the Air Corps. The field is being built on a site which was formerly a farm.

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There are still reports in the Air Corps that the field is being built on a site which was formerly a farm. The field is being built on a site which was formerly a farm.

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Martin Firm Bond Issue  
Of \$3,000,000 Released

BALTIMORE (AP)—The Glenn L. Martin Company has increased its registration by the release of \$3,000,000 in long-term debt. The company, which is known as the Martin Aircraft Company, has increased its registration by the release of \$3,000,000 in long-term debt.

The company's new plant in working on government contracts is expected to be completed by the end of the year. The company, which is known as the Martin Aircraft Company, has increased its registration by the release of \$3,000,000 in long-term debt.

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## Mileage Transported by Plane

PHILADELPHIA (AP)—The mileage transported by plane in the United States is expected to be a record this year. The mileage transported by plane in the United States is expected to be a record this year.

## Nichols-Bentley Issues Report

ST. LOUIS (AP)—The Nichols-Bentley report on the state of the aviation industry is expected to be a record this year. The Nichols-Bentley report on the state of the aviation industry is expected to be a record this year.

## Six Travel Aids for C.A.S.

WEDGETTA (AP)—Travel Aid Manual (TAM) is a new publication by the Civil Aeronautics Administration. The TAM is a new publication by the Civil Aeronautics Administration.

General Property Sold for \$65,000  
SUFFOLK (AP)—A 100-acre estate property and some of the General Property Company, which is known as the General Property Company, has sold the property for \$65,000.

Expect 40 Planes  
In Baltimore Show

BALTIMORE (AP)—Thirty planes have already been ordered by the Baltimore Aircraft Show and it is expected that at least 40 will have been ordered by the show opens Dec. 5.

The company's new plant in working on government contracts is expected to be completed by the end of the year. The company, which is known as the Martin Aircraft Company, has increased its registration by the release of \$3,000,000 in long-term debt.

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## Dr. Doerner Arrives



Dr. Doerner, who is a member of the General Property Company, has arrived in the country to conduct business with officials of the General Property Company and other officials of the General Property Company.

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## Lockheed Low-Wing Completed for Lindbergh



SUCCESSFUL TEST FLIGHTS have been completed by W. N. Harper, Lockheed factory test pilot of the low-wing aircraft, the Lockheed Low-Wing, designed by Col. Charles A. Lindbergh. This plane is essentially the same type as that ordered by Boeing for his proposed trans-Pacific flight enroute from Tacoma to Tokyo. Japan. Lindbergh's plane presents many more requirements over the first low-wing Lockheed, the details of which have been closely guarded by the factory. It reveals the plane does not differ from standard Lockheed concepts, except that the wing is mounted beneath the fuselage.

The standard Lockheed fairing is

used, but wing spread has been increased to accommodate a greater fuel load. The new Lindbergh plane is said to provide sufficient fuel capacity for a 4,500-mile flight. There are two open cockpits in rear and above the wing, each with separate controls. A separate engine instrument board, located by the Pioneer Instrument Company, of Brooklyn, N. Y., has been fitted on the front cockpit with an altimeter, air speed, and climb indicator in the rear cockpit. The plane has been tested and finished throughout as a de facto long distance craft. It has been thought that the Colbird and its first flight will use a great deal in business and pleasure trip planned for the future.

## U.A.T. Propeller Firms Now Hamilton Standard

VIRMAKKEE (en v) — The Hamilton Aircraft Company, Inc., of this city, and the Standard Steel Propeller Corporation, of Pittsburgh, have been consolidated into the Hamilton Standard Propeller Corporation, a subsidiary in United Aircraft and Transport Corporation.

Officers of the new firm include Thomas F. Hamilton, chairman of the board; Harry A. Knudsen, president; E. F. Wilson, vice-president; August E. Vogel, vice president; and J. H. Nelson, secretary. Thomas J. Ignazio, treasurer. Among the directors are W. B. Davidson, president of Hamilton Standard and Transport Corporation; Frederick H. Henschel, president of United Aircraft and Transport Corporation; and of Pratt and Whitney and J. H. Killham, Jr., chairman of the board of the Pioneer-Pittsburgh Trust Company. Following withdrawal of the two companies, plans are being made for the consolidation of the engineering and research departments for the purpose of expediting the development of existing designs and developing new ones. Changes for speed testing are considerable in the Hamilton Standard.

Los Angeles is now the location of a factory branch and service station and a regional office is carried there. To facilitate engine and engine superintendence, complete heat-treating and straightening equipment is being installed. Additional plants are being contemplated for various other strategic points.

The standard price list, as issued by the Standard Steel Propeller Corporation in June of this year, is still in effect according to the announcement.

## Miss Earhart Sets Record

LOS ANGELES (en v) — What is claimed to be a new speed record for women was established here on Nov. 22 by Amelia Earhart, trans Atlantic pilot. Over a mile course at the Metropolitan Airport, she averaged 164.17 mph over the four laps, being aided by 20 mph on one of the laps by Joe Nikowski, leader for the American Automobile Association. Miss Earhart, a student of Pittsburgh, said to have held the former record, 156 mph. Miss Earhart made the flight in a Group powered Lockheed Vega monoplane.

## Seek New N. Y. Altitude Law

NEW YORK (en v) — Following an airplane crash in the heart of the city recently, Governor C. D. Bakken, Police Commissioner Robert W. Felt, and the police are seeking a new law to regulate the use of balloons which would prohibit them over the city at altitudes of less than 7,000 to 10,000 ft. He also wishes to determine if a law would be passed but professional firms from ending the city.

## Safe Plane Contest Entry List Narrows

MITCHELL, FIELD (en v) — The safe plane contest, a possible one of the longest held between Westworth and J. S. McDowell, Jr., each an engineer, is further tests by the 1-3-5-7-9-11-13-15-17-19-21-23-25-27-29-31-33-35-37-39-41-43-45-47-49-51-53-55-57-59-61-63-65-67-69-71-73-75-77-79-81-83-85-87-89-91-93-95-97-99-101-103-105-107-109-111-113-115-117-119-121-123-125-127-129-131-133-135-137-139-141-143-145-147-149-151-153-155-157-159-161-163-165-167-169-171-173-175-177-179-181-183-185-187-189-191-193-195-197-199-201-203-205-207-209-211-213-215-217-219-221-223-225-227-229-231-233-235-237-239-241-243-245-247-249-251-253-255-257-259-261-263-265-267-269-271-273-275-277-279-281-283-285-287-289-291-293-295-297-299-301-303-305-307-309-311-313-315-317-319-321-323-325-327-329-331-333-335-337-339-341-343-345-347-349-351-353-355-357-359-361-363-365-367-369-371-373-375-377-379-381-383-385-387-389-391-393-395-397-399-401-403-405-407-409-411-413-415-417-419-421-423-425-427-429-431-433-435-437-439-441-443-445-447-449-451-453-455-457-459-461-463-465-467-469-471-473-475-477-479-481-483-485-487-489-491-493-495-497-499-501-503-505-507-509-511-513-515-517-519-521-523-525-527-529-531-533-535-537-539-541-543-545-547-549-551-553-555-557-559-561-563-565-567-569-571-573-575-577-579-581-583-585-587-589-591-593-595-597-599-601-603-605-607-609-611-613-615-617-619-621-623-625-627-629-631-633-635-637-639-641-643-645-647-649-651-653-655-657-659-661-663-665-667-669-671-673-675-677-679-681-683-685-687-689-691-693-695-697-699-701-703-705-707-709-711-713-715-717-719-721-723-725-727-729-731-733-735-737-739-741-743-745-747-749-751-753-755-757-759-761-763-765-767-769-771-773-775-777-779-781-783-785-787-789-791-793-795-797-799-801-803-805-807-809-811-813-815-817-819-821-823-825-827-829-831-833-835-837-839-841-843-845-847-849-851-853-855-857-859-861-863-865-867-869-871-873-875-877-879-881-883-885-887-889-891-893-895-897-899-901-903-905-907-909-911-913-915-917-919-921-923-925-927-929-931-933-935-937-939-941-943-945-947-949-951-953-955-957-959-961-963-965-967-969-971-973-975-977-979-981-983-985-987-989-991-993-995-997-999-1001-1003-1005-1007-1009-1011-1013-1015-1017-1019-1021-1023-1025-1027-1029-1031-1033-1035-1037-1039-1041-1043-1045-1047-1049-1051-1053-1055-1057-1059-1061-1063-1065-1067-1069-1071-1073-1075-1077-1079-1081-1083-1085-1087-1089-1091-1093-1095-1097-1099-1101-1103-1105-1107-1109-1111-1113-1115-1117-1119-1121-1123-1125-1127-1129-1131-1133-1135-1137-1139-1141-1143-1145-1147-1149-1151-1153-1155-1157-1159-1161-1163-1165-1167-1169-1171-1173-1175-1177-1179-1181-1183-1185-1187-1189-1191-1193-1195-1197-1199-1201-1203-1205-1207-1209-1211-1213-1215-1217-1219-1221-1223-1225-1227-1229-1231-1233-1235-1237-1239-1241-1243-1245-1247-1249-1251-1253-1255-1257-1259-1261-1263-1265-1267-1269-1271-1273-1275-1277-1279-1281-1283-1285-1287-1289-1291-1293-1295-1297-1299-1301-1303-1305-1307-1309-1311-1313-1315-1317-1319-1321-1323-1325-1327-1329-1331-1333-1335-1337-1339-1341-1343-1345-1347-1349-1351-1353-1355-1357-1359-1361-1363-1365-1367-1369-1371-1373-1375-1377-1379-1381-1383-1385-1387-1389-1391-1393-1395-1397-1399-1401-1403-1405-1407-1409-1411-1413-1415-1417-1419-1421-1423-1425-1427-1429-1431-1433-1435-1437-1439-1441-1443-1445-1447-1449-1451-1453-1455-1457-1459-1461-1463-1465-1467-1469-1471-1473-1475-1477-1479-1481-1483-1485-1487-1489-1491-1493-1495-1497-1499-1501-1503-1505-1507-1509-1511-1513-1515-1517-1519-1521-1523-1525-1527-1529-1531-1533-1535-1537-1539-1541-1543-1545-1547-1549-1551-1553-1555-1557-1559-1561-1563-1565-1567-1569-1571-1573-1575-1577-1579-1581-1583-1585-1587-1589-1591-1593-1595-1597-1599-1601-1603-1605-1607-1609-1611-1613-1615-1617-1619-1621-1623-1625-1627-1629-1631-1633-1635-1637-1639-1641-1643-1645-1647-1649-1651-1653-1655-1657-1659-1661-1663-1665-1667-1669-1671-1673-1675-1677-1679-1681-1683-1685-1687-1689-1691-1693-1695-1697-1699-1701-1703-1705-1707-1709-1711-1713-1715-1717-1719-1721-1723-1725-1727-1729-1731-1733-1735-1737-1739-1741-1743-1745-1747-1749-1751-1753-1755-1757-1759-1761-1763-1765-1767-1769-1771-1773-1775-1777-1779-1781-1783-1785-1787-1789-1791-1793-1795-1797-1799-1801-1803-1805-1807-1809-1811-1813-1815-1817-1819-1821-1823-1825-1827-1829-1831-1833-1835-1837-1839-1841-1843-1845-1847-1849-1851-1853-1855-1857-1859-1861-1863-1865-1867-1869-1871-1873-1875-1877-1879-1881-1883-1885-1887-1889-1891-1893-1895-1897-1899-1901-1903-1905-1907-1909-1911-1913-1915-1917-1919-1921-1923-1925-1927-1929-1931-1933-1935-1937-1939-1941-1943-1945-1947-1949-1951-1953-1955-1957-1959-1961-1963-1965-1967-1969-1971-1973-1975-1977-1979-1981-1983-1985-1987-1989-1991-1993-1995-1997-1999-2001-2003-2005-2007-2009-2011-2013-2015-2017-2019-2021-2023-2025-2027-2029-2031-2033-2035-2037-2039-2041-2043-2045-2047-2049-2051-2053-2055-2057-2059-2061-2063-2065-2067-2069-2071-2073-2075-2077-2079-2081-2083-2085-2087-2089-2091-2093-2095-2097-2099-2101-2103-2105-2107-2109-2111-2113-2115-2117-2119-2121-2123-2125-2127-2129-2131-2133-2135-2137-2139-2141-2143-2145-2147-2149-2151-2153-2155-2157-2159-2161-2163-2165-2167-2169-2171-2173-2175-2177-2179-2181-2183-2185-2187-2189-2191-2193-2195-2197-2199-2201-2203-2205-2207-2209-2211-2213-2215-2217-2219-2221-2223-2225-2227-2229-2231-2233-2235-2237-2239-2241-2243-2245-2247-2249-2251-2253-2255-2257-2259-2261-2263-2265-2267-2269-2271-2273-2275-2277-2279-2281-2283-2285-2287-2289-2291-2293-2295-2297-2299-2301-2303-2305-2307-2309-2311-2313-2315-2317-2319-2321-2323-2325-2327-2329-2331-2333-2335-2337-2339-2341-2343-2345-2347-2349-2351-2353-2355-2357-2359-2361-2363-2365-2367-2369-2371-2373-2375-2377-2379-2381-2383-2385-2387-2389-2391-2393-2395-2397-2399-2401-2403-2405-2407-2409-2411-2413-2415-2417-2419-2421-2423-2425-2427-2429-2431-2433-2435-2437-2439-2441-2443-2445-2447-2449-2451-2453-2455-2457-2459-2461-2463-2465-2467-2469-2471-2473-2475-2477-2479-2481-2483-2485-2487-2489-2491-2493-2495-2497-2499-2501-2503-2505-2507-2509-2511-2513-2515-2517-2519-2521-2523-2525-2527-2529-2531-2533-2535-2537-2539-2541-2543-2545-2547-2549-2551-2553-2555-2557-2559-2561-2563-2565-2567-2569-2571-2573-2575-2577-2579-2581-2583-2585-2587-2589-2591-2593-2595-2597-2599-2601-2603-2605-2607-2609-2611-2613-2615-2617-2619-2621-2623-2625-2627-2629-2631-2633-2635-2637-2639-2641-2643-2645-2647-2649-2651-2653-2655-2657-2659-2661-2663-2665-2667-2669-2671-2673-2675-2677-2679-2681-2683-2685-2687-2689-2691-2693-2695-2697-2699-2701-2703-2705-2707-2709-2711-2713-2715-2717-2719-2721-2723-2725-2727-2729-2731-2733-2735-2737-2739-2741-2743-2745-2747-2749-2751-2753-2755-2757-2759-2761-2763-2765-2767-2769-2771-2773-2775-2777-2779-2781-2783-2785-2787-2789-2791-2793-2795-2797-2799-2801-2803-2805-2807-2809-2811-2813-2815-2817-2819-2821-2823-2825-2827-2829-2831-2833-2835-2837-2839-2841-2843-2845-2847-2849-2851-2853-2855-2857-2859-2861-2863-2865-2867-2869-2871-2873-2875-2877-2879-2881-2883-2885-2887-2889-2891-2893-2895-2897-2899-2901-2903-2905-2907-2909-2911-2913-2915-2917-2919-2921-2923-2925-2927-2929-2931-2933-2935-2937-2939-2941-2943-2945-2947-2949-2951-2953-2955-2957-2959-2961-2963-2965-2967-2969-2971-2973-2975-2977-2979-2981-2983-2985-2987-2989-2991-2993-2995-2997-2999-3001-3003-3005-3007-3009-3011-3013-3015-3017-3019-3021-3023-3025-3027-3029-3031-3033-3035-3037-3039-3041-3043-3045-3047-3049-3051-3053-3055-3057-3059-3061-3063-3065-3067-3069-3071-3073-3075-3077-3079-3081-3083-3085-3087-3089-3091-3093-3095-3097-3099-3101-3103-3105-3107-3109-3111-3113-3115-3117-3119-3121-3123-3125-3127-3129-3131-3133-3135-3137-3139-3141-3143-3145-3147-3149-3151-3153-3155-3157-3159-3161-3163-3165-3167-3169-3171-3173-3175-3177-3179-3181-3183-3185-3187-3189-3191-3193-3195-3197-3199-3201-3203-3205-3207-3209-3211-3213-3215-3217-3219-3221-3223-3225-3227-3229-3231-3233-3235-3237-3239-3241-3243-3245-3247-3249-3251-3253-3255-3257-3259-3261-3263-3265-3267-3269-3271-3273-3275-3277-3279-3281-3283-3285-3287-3289-3291-3293-3295-3297-3299-3301-3303-3305-3307-3309-3311-3313-3315-3317-3319-3321-3323-3325-3327-3329-3331-3333-3335-3337-3339-3341-3343-3345-3347-3349-3351-3353-3355-3357-3359-3361-3363-3365-3367-3369-3371-3373-3375-3377-3379-3381-3383-3385-3387-3389-3391-3393-3395-3397-3399-3401-3403-3405-3407-3409-3411-3413-3415-3417-3419-3421-3423-3425-3427-3429-3431-3433-3435-3437-3439-3441-3443-3445-3447-3449-3451-3453-3455-3457-3459-3461-3463-3465-3467-3469-3471-3473-3475-3477-3479-3481-3483-3485-3487-3489-3491-3493-3495-3497-3499-3501-3503-3505-3507-3509-3511-3513-3515-3517-3519-3521-3523-3525-3527-3529-3531-3533-3535-3537-3539-3541-3543-3545-3547-3549-3551-3553-3555-3557-3559-3561-3563-3565-3567-3569-3571-3573-3575-3577-3579-3581-3583-3585-3587-3589-3591-3593-3595-3597-3599-3601-3603-3605-3607-3609-3611-3613-3615-3617-3619-3621-3623-3625-3627-3629-3631-3633-3635-3637-3639-3641-3643-3645-3647-3649-3651-3653-3655-3657-3659-3661-3663-3665-3667-3669-3671-3673-3675-3677-3679-3681-3683-3685-3687-3689-3691-3693-3695-3697-3699-3701-3703-3705-3707-3709-3711-3713-3715-3717-3719-3721-3723-3725-3727-3729-3731-3733-3735-3737-3739-3741-3743-3745-3747-3749-3751-3753-3755-3757-3759-3761-3763-3765-3767-3769-3771-3773-3775-3777-3779-3781-3783-3785-3787-3789-3791-3793-3795-3797-3799-3801-3803-3805-3807-3809-3811-3813-3815-3817-3819-3821-3823-3825-3827-3829-3831-3833-3835-3837-3839-3841-3843-3845-3847-3849-3851-3853-3855-3857-3859-3861-3863-3865-3867-3869-3871-3873-3875-3877-3879-3881-3883-3885-3887-3889-3891-3893-3895-3897-3899-3901-3903-3905-3907-3909-3911-3913-3915-3917-3919-3921-3923-3925-3927-3929-3931-3933-3935-3937-3939-3941-3943-3945-3947-3949-3951-3953-3955-3957-3959-3961-3963-3965-3967-3969-3971-3973-3975-3977-3979-3981-3983-3985-3987-3989-3991-3993-3995-3997-3999-4001-4003-4005-4007-4009-4011-4013-4015-4017-4019-4021-4023-4025-4027-4029-4031-4033-4035-4037-4039-4041-4043-4045-4047-4049-4051-4053-4055-4057-4059-4061-4063-4065-4067-4069-4071-4073-4075-4077-4079-4081-4083-4085-4087-4089-4091-4093-4095-4097-4099-4101-4103-4105-4107-4109-4111-4113-4115-4117-4119-4121-4123-4125-4127-4129-4131-4133-4135-4137-4139-4141-4143-4145-4147-4149-4151-4153-4155-4157-4159-4161-4163-4165-4167-4169-4171-4173-4175-4177-4179-4181-4183-4185-4187-4189-4191-4193-4195-4197-4199-4201-4203-4205-4207-4209-4211-4213-4215-4217-4219-4221-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## THE BUYER'S LOG BOOK



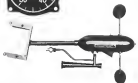
## Pioneer Air Log

THE air log, an instrument used for showing the distance traveled by aircraft, is now being manufactured by the Pioneer Instrument Company, 234 Lexington Avenue, Brooklyn, New York. The transmitter of the air log carries a small propeller which revolves as the airplane goes forward, once a mile actuating a valve which transfers vacuum, created by a small Venturi tube, to an indicator on the instrument board, thus adding one mile to the recorded distance.

The indicator has a hand which makes one revolution of the dial for each hundred miles, the hand being recorded by a wheel counter. By adding the indicator



Left—The Air Log and indicator. Below—the wheel counter for the instrument.



of the counter to that of the hand the distance traveled is read. The air log indicator is 2 1/2 in. in diameter and may also be calibrated to show nautical miles or kilometers. The indicator weighs 7 lb., the transmitter 1 1/2 lb. and the connecting tubing .06 lb. per ft.

## Breuer Electric Paint Sprayer

THE Breuer Electric Mfg. Co., 852 Rockwood St., Chicago, has recently placed on the market a new electric paint spray machine of the compressor type. It is intended for touch-up work, shading and light finishing and refinishing jobs, as well as semi-production and maintenance industrial painting work.

The new "Tornado" portable electric paint sprayer is built of aluminum, weighs equipped with 4 hp General Electric Universal Motor, and develops a pressure of over 35 lb. The compressor unit weighs 7 lb. The gun weighs 2 lb.

The Tornado spray gun is equipped with two types

one suited for fan spray and the other, narrow spray, and covering an area of 2 in. to 14 in. A handy adjusting screw controls the amount of paint to be used.

The Tornado, complete, is equipped with quart container, two pipes, 20 in., of reinforced rubber covered cord, 8 in. of rubber web covered hose.

## TRADE CATALOGS

AERONAUTICAL SUPPLIES. Catalog B for 1929 has just been issued by the Robertson Aircraft Corporation, Division of Universal Aviation Corporation, Lambert, St. Louis Flying Field, Annapolis, Mo. This publication, which is known as the Aeronautical Supply Catalog, lists a complete selection of aeronautical equipment as well as interesting tables and descriptive matter on certain standard aeronautical products. A number of standard tables of figures and a listing of parts for several of these engines also is incorporated or included in the text. It is 106 pages in length.

BALL BEARINGS. The second edition of the ball bearing manual published by the Gessner Ball Bearing Division, Mueller-Ruckelsh Corporation, Jena, Germany, N. Y., has recently been issued and contains 252 pages of information on the subject of ball bearings. In addition to a number of tables showing characteristics of the various types of ball bearings manufactured by this company, there are a number of cut-away photographs and diagrams showing construction, installation and use of these ball bearings. One section of the manual is devoted to engineering data relative to ball bearings and their application. Included in this section is detailed data required for calculating bearing loads, safety factors, limiting speeds, data regarding the selection of bearing-grade, and a glossary of ball bearing terms.

AERONAUTICAL SUPPLIES AND EQUIPMENT. A 200-page catalog of aeronautical supplies and equipment has recently been published by the Nicholas Brasley Airplane Company, Inc., Marshall, Mo. This booklet, which is designated Catalog G, includes complete parts lists of the Curtiss G-3 and G-3M, Hispania Leblond, Wright Whirlwind and Vulture engines, power plant equipment, aeronautical tools, tools and materials also are included among the articles described. A number of helpful tables are also included in the catalog.

INSTRUMENTS. The instruments manufactured by the Anderson-Wickes A. G., Berlin, Prussia, Germany, have been listed in a 40-page catalog issued by the American Aviation Corporation, Houston, Texas. Distribution of these instruments in America. Among the products featured in this catalog are: vertical gyro, a combined altimeter and air-speed indicator having vertical and rectilinear scale, a variometer to measure the speed of climb, a horizon climbing gyroscope and a number of recording instruments. Several types of compass and a number of interesting and unusual combinations of instruments are included.

# Gulfpride Oil



## AMERICA'S FINEST AVIATION OIL



## GULFPRIDE OILS

provide to the highest extent those desirable features necessary for satisfactory operation of Aviation Motors.

- 1 Oil economy—due to their extremely long life, resistance to oxidation and low volatility.
- 2 Lowered maintenance—because of proper lubricating qualities and very low carbon and gum forming characteristics.
- 3 Proper lubrication—a grade for each motor and condition of operation.
- 4 High quality—exhibit minimum change of body under extremes of temperatures.

GULFPRIDE OILS are approved by leading Aviation Engine Builders.

Manufactured for Aviation Engine Lubrication in five grades or body designations:

Gulfpride Oil 75	Gulfpride Oil 120
Gulfpride Oil 100	Gulfpride Oil 150
Gulfpride Oil 200	

### GULF REFINING COMPANY

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KATONAH, N. Y.  
PHILADELPHIA, PA.  
PORT ARTHUR, TEX.





This is one of a series of advertisements directed originally to advertising men in an effort to make industrial advertising more profitable to buyers and sellers. It is printed in these pages as an indication to readers that McGraw-Hill publishing standards mean advertising effectiveness as well as editorial quality.

## Some serious thoughts from a frivolous discussion of advertising

Our men were discussing advertising around the bridge table. Their discussion is dignified here in substantially innocent.



THE news, editorial and advertising pages of the advertising journals reflect the serious attention being given the subject discussed more or less lightly above.

Industrial Advertising suffers, of course, with all advertising when advertising is under fire. Yet, by and large, Industrial Advertising copy has followed the sound principles of appeal described on pages 51 to 68 of the McGraw-Hill study, *Industrial Marketing at Work*. Does not the viewpoint of "Pass" suggest that earnest minded advertising men can help all advertising by studying Industrial Advertising . . . its use of restraint, facts, tests, logic and bonafide testimonials as opposed to "blue sky"?

**One diamond** (a publicity director) . . . "You can have your advertising job. Not for me. Advertising's getting too biased unpopular with the public."

**One spade** (an industrial relations investigator) . . . "Ed, why don't you and I jack up our jobs, go out as crusaders and help recapture the public's faith in advertising?"

**One no-trump** (a McGraw-Hill advertising man) . . . "What are you fellows and the public slandering anyway, advertising principles or advertising practices?"

**Pass** (an Industrial Advertising manager) . . . "Keep it up, you aren't making me feel bad. Most of this present-day criticism of advertising comes from persons who never see Industrial Advertising and of course know nothing about real advertising. If there is one place where advertising *must* be free of bunk, exaggeration and spurious testimonials it is in the industrial field where it is read by engineering minds first and emotional minds last."

## McGraw-Hill PUBLICATIONS

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## Learn to Fly



### Where Sunshine Spends the Winter

Learn to fly without the hazard of icy blasts and biting cold, of snow and sleet. Train at AIRTECH where sunshine spends the winter.

In addition to the main school at San Diego, AIRTECH conducts a winter branch, from November 15 to March 15, at Palm Springs, California. At this foremost winter resort, AIRTECH students learn to fly in America's most perfect winter climate.

At Palm Springs and San Diego, AIRTECH operates Schools of Aviation under Department of Commerce approval. Students now enrolling for this recognized training will be equipped to take their place in aviation when spring brings renewed activity on Eastern Airports.

Write now for "Flight Facts from Lindbergh Field"—and learn aviation where sunshine spends the winter.

## Airtech School of Aviation

Department of Commerce Approved  
Transport Ground and Flying School

Lindbergh Field

San Diego, California

*This is one of a series of advertisements devoted especially to advertising men in an effort to make industrial advertising more profitable to buyer and seller. It is printed in these pages as no intention is made that McGraw-Hill publishing standards mean advertising effectiveness as well as editorial quality.*

## Of course, this doesn't happen every day

Recently in Erie, Pa., a McGraw-Hill circulation man visited a plant to get subscriptions and got the surprise of his life. The story may be interesting to those advertising men, who, in selecting advertising mediums, consider not only reader interest but how circulation is built.

Frankly, this Erie plant was not covered as a unit\* by certain McGraw-Hill publications. The circulation man was there to find out why. In keeping with McGraw-Hill policy he called at the front office, learned the plant set-up and obtained permission to interview key men.

When, finally, he reported back to the front office the surprise came. Unknown to him an executive had watched him work. This executive greeted him somewhat like this:

"SO this is the way McGraw-Hill builds circulation! It interests me because you see we are advertising in your *Engineering News-Record*. We are now going after some mining business and your demonstration here convinces me that your *Coal Age* is a good place for us to advertise."

McGraw-Hill circulation headquarters in New York will gladly explain its principles and practices of circulation building to those who are interested.

## McGraw-Hill PUBLICATIONS

New York Chicago Cleveland Detroit Philadelphia St. Louis  
Garden City San Francisco Boston London

\*Full coverage is given in McGraw-Hill publications. It means covering the key men of each department or function with the right publication.

## Modern aircraft design, mechanics and maintenance—in one complete handbook!



No matter whether your job is in the cockpit, the hangar, the factory or the airport, this authoritative aviation guide will give you instantly available information. It is a standard source of reference for the experienced man and a thorough medium of training for the student.

Fourth Edition

## AIRCRAFT HANDBOOK

By FRED H. COLVIN, Editor, American Mechanics and HENRY F. COLVIN, Project Engineering Company  
400 pages, 5x7 1/2, 150 illustrations, flexible binding,  
\$1.00, postpaid

THE AIRCRAFT HANDBOOK, by reason of its latest complete revision and enlargement, meets a universal need in the aviation world.

To the designer and factory man it gives tested and accurate data on strength of materials, construction methods, rigging, wing shapes, etc. To the mechanic and man in the hangar it offers up-to-the-minute information on motors, accessories, trouble shooting, and servicing. To the student or veteran pilot it gives the air commerce regulations, requirements for various types of licenses, equipment needed, and the latest methods of navigation through instruments such as drift meter, earth inductor compass, etc. To everyone interested in aviation this book offers a complete mental picture of aviation and together with a concise and comprehensive explanation of aircraft control and management.

See this book for 10 days FREE

Put the Free Aircraft Handbook to its greatest working test for 10 days without cost or obligation. Examine it. If favorable return you make your decision whether you will buy it.

Read the coupon TODAY

## McGraw-Hill FREE EXAMINATION COUPON

McGraw-Hill Book Co., Inc., 1221 Avenue of the Americas, New York

You may read and use this book, *Aircraft Handbook*, for 10 days FREE. Please return it to me by the date indicated on the coupon. I will then mail you the book or return it postpaid within 10 days of receipt.

Name \_\_\_\_\_ (Please Print)

Address \_\_\_\_\_

City and State \_\_\_\_\_

Official Position \_\_\_\_\_

Name of Company \_\_\_\_\_

I enclose this coupon to return authorities to C. & G. and Company only.

### Chapter Headings

1. Single Airplane Theory
2. Types of Airplanes
3. Rigging and Servicing the Plane
4. The Airplane Engine
5. Trouble Shooting for Airplane Engines
6. The Propeller
7. Engine and Piston Accessories
8. Aircraft Instruments
9. Airplane Construction
10. Materials for Aircraft Construction
11. S.A.E. Standards
12. Airships, or Dirigible Balloons
13. Construction of Airships
14. Air Commerce Regulations
15. Nomenclature for Aviators

Profusely illustrated with diagrams  
and photographs



## "AEROVEL" Mohair Fabrics

A DISTINCTIVE group of fabrics developed expressly for "added attractiveness in aeroplane cabin interiors".

Prices and samples of "Aerovel" will be sent upon request.

*The Sheldon Looms*

AEROPLANE FABRICS DIVISION  
ONE PARK AVENUE, NEW YORK

Mid-western Representatives:

J. E. Mounagh Company  
1115 Kemmerer Avenue  
Chicago, Illinois



## The Monoprep

This sturdy training plane has become standard equipment for student training by a large and rapidly increasing number of the most prominent aviation schools in the country.

The Monoprep is of the open type with side by side seating which permits constant conversation between instructor and student while in the air. This results in a more thorough and rapid training. Special attention has been paid to visibility. Perfect vision in all directions is provided by a large canvas air rest of wing and open construction of the cockpit.



Dual rudder pedals, control sticks and throttles, as illustrated elsewhere, are built-in features, as well as the adjustable stabilizer and seat with removable cushions so that the seat pack parachute may be worn if desired. Doors on each side of the cockpit permit submersed entrance and exit. Instruments include altimeter, tachometer, clock, oil pressure, temperature gauges and gasoline gauge.

The Monoprep's low initial cost permits two ships on the line at the small cost of one. Operators for approximately \$1.00 per hour for fuel. The Monoprep allows schools to charge less for instruction and will show greater profit.

Complete specifications and performance data will gladly be sent upon request.

5203—Fleetway Model, Illinois

Department of Commerce  
Certificate of Approval No. 218

## Mono Aircraft Corporation

Subsidiary of Allied Aviation Industries, Inc.  
MOLINE, ILLINOIS



Bakelite Molded contact blocks  
Made by Dayton Engineering Molding Co., Dayton, Ohio

## Bakelite Molded again proves superior for airplane work

WHEN another form of insulation was used for contact blocks, difficulty was experienced in securing accurately positioned holes, and even more operations were required to complete each block. Through adhering to Bakelite Molded a superior block is obtained at a considerable saving in cost.

Each Bakelite Molded block is completed in a single operation, with all of the counterbore screw and terminal post holes accurately formed and positioned. The block comes from the mold with a hard, lustrous surface that resists severe usage.

Bakelite Molded possesses excellent insulating properties, and is very strong. It is non-hygroscopic, and will neither shrink nor swell under exposure to varying atmospheric conditions. These facts make this material exceptionally suitable for insulating the electrical equipment of aircraft.

Manufacturers are invited to order the complete "Bakelite Molded" literature from:  
Write to: "Bakelite Molded"

BAKELITE CORPORATION  
260 Park Avenue New York, N. Y.  
Chicago Office: 621 W. 124th Street  
Bakelite Corp. of Canada, Ltd.  
111 Balfour Street Toronto, Ontario

# BAKELITE

THE NATIONAL OF A THOUSAND USES  
BUT NOT OF A THOUSAND COMPANIES



In the  
foremost  
ships...  
since the dawn  
of the industry

## WYMAN-GORDON CRANKSHAFTS

WYMAN-GORDON

*The crankshaft leaders*

Newark, Mass.

Long Island City, N. Y.



Travel Air Plane  
equipped with Pollak  
N. A. C. A. Cowling

Small Travel Air Plane  
with Pollak N. A. C. A. Cowling

## Speed up your planes with N. A. C. A. Cowling!

It has been demonstrated true and again that N. A. C. A. cowling will increase the speed of planes.

The Travel Air Plane above was equipped with Pollak N. A. C. A. Cowling and, as a result, increased its speed 15 or more miles an hour. In an eight hundred and ten miles test displacement race held at Hadley Field, Stratford, November 16th, five and a half miles were won by Travel Air Plane, both planes being equipped with Pollak N. A. C. A. Cowling. The additional speed being 15 M.P.H. The economy of such practice is obvious.

Cowling is but one of the many dependable standard parts and accessories we manufacture for the aviation industry. Some of them are Tanks, Manifolds, Fuel Line Fittings, Brass Structures, Cylinders and Cylinders, Landing Gear, Landing Gear, Landing Gear, Landing Gear, etc., etc.

Ask for further information in your representative

**Pollak Manufacturing Co.**  
541 Sixth Street, Arlington, N. J.

### STAR PATHFINDER COMPASS

Guiding the World's Aviators Since 1909

NO PILOT ever rode higher than his level for the Star Pathfinder Compass.

For nearly twenty years, in war and in peace, in fighting and in commercial flying, the Star Compass has ruled supreme with the greatest of the air. They know the importance of a trustworthy compass when the blackboard may prefer the wrong guidance of the Star.

Complete instructions, actually step by step, are sent to you with the Star Compass, so that you can be sure of its accuracy at all times.

**STAR COMPASS COMPANY**  
EAST MILTON, MASSACHUSETTS

Copyrighted Instruments Co. of America,  
201 West 10th Street, New York City

SOLE U. S. AGENTS: THE STAR COMPASS COMPANY

## HALL-ALUMINUM AIRCRAFT CORPORATION

Strong, Light Weight

## ALL-METAL

Airplanes, Seaplanes,  
Flying Boats and Floats

Standardized Drawn Sections and  
Stamped Parts Adaptable to Your  
Present Designs or New  
Designs Supplied

2050 ELMWOOD AVENUE  
BUFFALO, NEW YORK

Contractors to U. S. Navy

Winter or Summer  
— every facility  
for the Transport  
Organization or for  
the Private Flyer at  
CENTRAL AIRPORT!



PHILADELPHIA-CAMDEN



Camden Airport is one of the most important centers of aviation activity in the East. Located only 15 minutes from the heart of Philadelphia and even closer to Camden, it is naturally one of the most convenient and accessible airports in the world. Camden Airport has been fully equipped with every modern landing light, flood light and beacon necessitated by the most advanced airport systems. Here you will find a U. S. Government weather station prepared to give you immediate information on flying conditions. This is an advantage that the experienced pilot fully appreciates in winter flying. In addition to the weather station, there is a U. S. Government radio station and post office. Two great hangars, heated longways, each capable of holding twenty-two average sized ships, will protect your airplanes from inclement weather. If you are one of our year-rounders, you will be glad to have your plane pumped nearly forty miles a minute! A unique and lasting system means two of them, fresh and for your winter in cold weather. At the Camden Airport you will have a varied selection. Facilities for service are unusually complete. We will be glad to send information on any specific phase of this airport on request. Write Central Airport, Inc., P.O. Box 100, Philadelphia, Pa.

CENTRAL AIRPORT

## PERRY-AUSTEN

DOES

Doesn't Crack	Good Take Up
Doesn't Peel	Good Fill
Doesn't Rot	Easy to Apply

These marginal qualities of good dopes are demanded by experienced aircraft manufacturers. That they are obtained in PERRY-AUSTEN DOPES has been proved by Government and manufacturers. Laboratory tests and in practical service on thousands of aircraft and commercial vehicles.

PERRY-AUSTEN DOPES are produced by the latest combination of scientific data in the United States and are used by many of America's foremost aircraft manufacturers. Ask for our literature, suitable for large or small quantities.

Consultants to United States Government  
**PERRY-AUSTEN MFG. CO.**  
Main Office and Works: Granger, South Bend, N. Y.  
Tel. Duquesne 168-707

Chicago: 312 N. Dearborn St. Tel. Superior 7000

## WATER TIGHT!

FULLY and tightly enclosed, personnel engine in the center of the brake-offer easy. Results: Wheels and Brakes 24-hour Service Brake have added tremendously to the reliability of airplanes.

The brake and wheel are as near watertight as it is possible to make them.

Now in production in all standard sizes. (Only produced by patent and authorized to U.S. and abroad)

**BENDIX BRAKE COMPANY**  
General Offices and Plant, South Bend, Ind.  
Division of Bendix Aviation Corporation, Chicago

**BENDIX 4 BRAKES**  
200,000,000











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Debit	Amount	Credit	Amount
1	100.00	1	100.00
2	100.00	2	100.00
3	100.00	3	100.00
4	100.00	4	100.00
5	100.00	5	100.00
6	100.00	6	100.00
7	100.00	7	100.00
8	100.00	8	100.00
9	100.00	9	100.00
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94	100.00	94	100.00
95	100.00	95	100.00
96	100.00	96	100.00
97	100.00	97	100.00
98	100.00	98	100.00
99	100.00	99	100.00
100	100.00	100	100.00

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## Wings to Fly

Time	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100
1990	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100



Buhl Airsedan No. CA-6-41\*  
*"Doubles in Brass"*



The Ford Senior Alouette is an eight-place dual control plane, powered with a 7-cylinder Cessna engine.



**The Field Sport Almanac** is a charming, illustrated guide to the world of field sports. It is a must-have for anyone who loves to play or watch sports. The book is filled with colorful illustrations and detailed information about various sports, including baseball, basketball, football, and more. It is a great resource for both children and adults alike.



The Gold Medal of Honor is a top place that cannot be given away with the new 24 Weight Windward cruiser.

**T**HAT'S an old expression of the circus lingo. The chap who leads the elephants in the parade, does his stuff on the flying rings, then trots indolently in the Silver Cornet Band . . . that chap, they say, "doubles in brass." So does this Buhl Band and Auldred. It has more jobs . . . and more varied jobs . . . than the most versatile Jack of all trades. Passengers or performers . . . hairdressers or hay . . . mail or macaroons . . . regular info or social run . . . it's all in the



day's work. Close, snow, or flood...the Canadian North-west is no respecter of persons or of planets...she goes through on schedule. She's not only built to perform under any conditions, but is specially equipped to do so...standard landing gear for normal use...this for the long, hard winter...potholes when mountains and forests make lakes the only landing fields. Surely such consistent, dependable service implies unsurpassed design and craftsmanship.

## MAIL THIS COUPON

ELVE AIRCRAFT COMPANY, Manassas, Md.  
Construction suggested use, free of charge,  
your local Elve dealer.

Name \_\_\_\_\_

Addenda \_\_\_\_\_

City of State \_\_\_\_\_

**BULL AIRCRAFT COMPANY**  
MARYSVILLE, MICH.



Port	Line	Plane	STANDARD Landing	STANDARD Return	STANDARD Rate	STANDARD Notes
ALBANY	Central	Wasp	11:00	11:00	11:00	11:00
ALBUQUERQUE	Central	Wasp	11:00	11:00	11:00	11:00
ALBUQUERQUE	Central	Wasp	11:00	11:00	11:00	11:00
ALBUQUERQUE	Central	Wasp	11:00	11:00	11:00	11:00
ALBUQUERQUE	Central	Wasp	11:00	11:00	11:00	11:00
ALBUQUERQUE	Central	Wasp	11:00	11:00	11:00	11:00
ALBUQUERQUE	Central	Wasp	11:00	11:00	11:00	11:00
ALBUQUERQUE	Central	Wasp	11:00	11:00	11:00	11:00
ALBUQUERQUE	Central	Wasp	11:00	11:00	11:00	11:00
ALBUQUERQUE	Central	Wasp	11:00	11:00	11:00	11:00

## From Kansas City One of America's great air-centers go 46 routes

Port	Line	Plane	STANDARD Landing	STANDARD Return	STANDARD Rate	STANDARD Notes
ALBANY	Central	Wasp	11:00	11:00	11:00	11:00
ALBUQUERQUE	Central	Wasp	11:00	11:00	11:00	11:00
ALBUQUERQUE	Central	Wasp	11:00	11:00	11:00	11:00
ALBUQUERQUE	Central	Wasp	11:00	11:00	11:00	11:00
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ALBUQUERQUE	Central	Wasp	11:00	11:00	11:00	11:00
ALBUQUERQUE	Central	Wasp	11:00	11:00	11:00	11:00
ALBUQUERQUE	Central	Wasp	11:00	11:00	11:00	11:00



## And every line is powered with "Wasps"

A DAY to the west lies Los Angeles. A half day to the east—Cleveland. To Dallas in 7 hours. To Chicago in 4. Here in Kansas City, where 46 routes now converge, there has developed one of the great centers of America's new transport system—the air. A glance at the combined time-tables of these transport lines reveals a significant

fact. Every single line leaving Kansas City is now using Pratt & Whitney "Wasp" engines.

Here is a tribute not only to the unusual reserve of flying power of "Wasps." It is a tribute to the care which the great transport companies are taking to insure the utmost of dependability in every ship that flies.

THE  
**PRATT & WHITNEY AIRCRAFT CO**  
HARTFORD - CONNECTICUT  
Division of United Aircraft & Transport Corporation

Manufactured in Canada by Canadian Pratt & Whitney Aircraft Ltd.,  
Longueuil, Quebec, in Continental version by Bavarian Motor Works.



# Wasp & Hornet Engines